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The Farmer's Digest

Volume 12 November, 1948 Number 6

Should Farmers Breed High Testing Cows?

Condensed from the American Agriculturist

Leland W. Lamb

DAIRY farmers in the New York Milk Shed received $4.92 per cwt. for 3.5% milk with a differential of 7.8c for each point above or below 3.5% for July 1948. Compared to the 4c differential which was in effect until a few years ago, this 7.8c looks good to farmers. Consequently, the scramble to breed high testers is on. The question is, Can farmers afford to do this? Naturally, comparing two cows or two groups of cows producing equal quantities of milk, but with different tests, the higher testers will bring in the most income. But such is not cow nature. Usually, with high tests one gets low volume and vice versa.

About ten years ago I became involved in a discussion with my good friend Earl A. Beckwith of Ludlowville, New York. The Beckwith Jersey herd was testing about 6.0%. I said to Mr. Beckwith, "Earl, you can't afford to sell 6.0% milk on your market. Neither can you afford to put such milk in the cans of those customers who come here to your farm for it. What you need to do is to increase your volume per cow and cut your test." Earl saw the point and such a program was decided upon. Consequently, each time a new bull was selected for the herd he was selected to sire more milk with the idea that Earl would take lower test if need be.

In the intervening years the Beckwith herd has been gradually narrowed down as rapidly as possible to the descendants of one cow (Rosebud) which was in the herd ten years ago.

The success of Earl's program of increasing milk and cutting test is beautifully illustrated by a generation study of Rosebud's de-

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TABLE 1

		Milk	Butter fat
Rosebud	6 records aver.	—8103 lb. milk—	6.20%—502 lb. B. F.
2 Daughters	10 records aver.	—7838 lb. milk—	6.24%—489 lb. B. F.
8 Granddaughters ..	25 records aver.	—8465 lb. milk—	5.75%—488 lb. B. F.
11 Great granddaughters	14 records aver.	—9006 lb. milk—	5.38%—485 lb. B. F.
2 Great great granddaughters	2 records aver.	—9820 lb. milk—	5.29%—519 lb. B. F.

scendants. She had three daughters, all full sisters, sired by a bull selected before our program was inaugurated. Two of these three had records. The third was injured following first freshening, and had to be destroyed. Rosebud's family, together with their production, is shown in table 1.

This table shows that Mr. Beckwith was successful in increasing volume of milk, cutting test, and in maintaining pounds of butterfat. It seems significant that Rosebud's great-great-grandaughters are producing just about two thousand pounds more milk and thirty pounds more butterfat per cow than did her daughters. The reader will note however, that this increased *volume* has been obtained at the expense of practically a full per cent in the test of the milk produced—a drop from 6.24% to 5.29%.

This change in three generations has been accomplished within the limits of registered Jerseys. Obviously if a farmer is maintaining a registered herd, one of the incentives is the sale of breeding stock. Within this family twelve females, including Rosebud herself, have been sold as foundation females to other breeders. We also count twelve bull calves as having been sold for breeding purposes. We do not claim that this list is complete but we know, off hand, of this many. Six females have been sold for beef due to: udder injuries, 2; physical injury, 1; sterility, 3; one cow died of milk fever. The others are all in the herd today.

We think the reader will agree that Mr. Beckwith has been extraordinarily successful in the sale of breeding stock from this family. We think, also, that the reader will agree that the income from these sales was probably a mere pittance compared to the income from the milk checks. In other words, even in the best of dairy farming it's the milk checks that pay the bills. It seems, therefore, that the breeding program must be geared to the milk check.

The history of this family provides a striking example of planning the breeding program to provide maximum income from the sale of milk. The July 1948 milk price looks good to the breeders of high testers. They look long-

TABLE 2

Rosebud	8103 lb.	6.20% milk @	$7.03 per cwt.	$569.64*
2 daughters	7838 lb.	6.2 % milk @	7.03 per cwt.	551.01
Granddaughters	8475 lb.	5.8 % milk @	6.71 per cwt.	568.00
Great granddaughters	9006 lb.	5.4 % milk @	6.40 per cwt.	576.33
Great great granddaughters	9820 lb.	5.3 % milk @	6.32 per cwt.	620.62

* These are gross income figures only and do not take into account costs of production.

ingly at that 7.8c differential. Let us, however, consider the value of Rosebud's milk, and that of each group of her descendants under this pricing system.

At $4.92 per cwt. for 3.5% milk plus 7.8c for each point above 3.5% the value of the milk produced by each group is shown in table 2.

At today's market, Rosebud's great - great - granddaughters are bringing in nearly $70.00 more per cow than would her two daughters with their 2000 lbs. less milk and .9% higher test. Surely the higher-milking, lower-testing cows are paying off.

When a breeder decides to increase or to cut test he needs to know how much change in milk he needs to get to compensate for the change in test. Let us see how much milk it would take at various tests to equal the amounts of butterfat produced by Rosebud and each generation of her descendants. (See Table 3).

Now let us figure out the effect, if any, on a farmer's income if he were to change, at today's milk market, the test of each generation of Rosebud's descendants. The value of each generation's milk, per cow, at different tests but producing same amount of butterfat, with milk at $4.92 per cwt. 7.8c differential is shown in Table 4.

It seems to me that only one conclusion is possible from these figures, namely with a market geared to 3.5% milk the wise breeder will manage his breeding program to produce 3.5% milk. This holds even at a 7.8c differential from $4.92 for 3.5% milk.

Assuming that other breeders can be as successful as Mr. Beckwith has been in increasing his milk flow enough to compensate

TABLE 3

	%	Lb. B. F.	6.2% Lb. Milk	4.3% Lb. Milk	4.0% Lb. Milk	3.5% Lb. Milk
Rosebud	6.2	502	8103	11674	12550	14343
Daughters	6.2	489	7887	11372	12225	13971
Granddaughters	5.8	488	7871	11349	12220	13943
Great granddaughters	5.4	485	7823	11279	12125	13857
Great great granddaughters	5.3	519	8371	12070	12975	14829

TABLE 4

	6.2%	4.3%	4.0%	3.5%	Difference favor 3.5%
Rosebud	$ 569.64	$ 647.21	$666.41	$705.68	$136.04
Daughters	554.45	630.46	649.15	687.37	132.92
Granddaughters	553.33	629.19	647.82	686.00	132.67
Great granddaughters	549.96	625.31	643.84	681.76	131.80
Great great granddaughters	588.48	669.16	688.97	729.59	141.11
Average loss of each compared to 3.5%	$ 134.91	$ 57.81	$ 38.84		$134.91
Total loss 20 cows	$2698.20	$1156.20	$776.80		

for decreased test, it would seem that they should waste no time in adjusting their breeding programs to produce more lower testing milk per cow.

Comparatively, the market pays most for 3.5% milk. Does it want it? The answer to that question, it seems to me can only be a loud and emphatic "NO". The housewife does not want 3.5% milk. Therefore, the distributor does not want 3.5% milk. *But,* only a *small* proportion of the housewives will pay the premium required to get a premium milk—4.0% or 4.3% milk. So what does the market do? It encourages, in an inadequate way, the production of milk testing 4.0% and over, to mix with the milk testing 3.5% and below. In this way the housewife gets milk that she wants for a price she will pay—and the producer of the high test milk takes the rap!

An old recommendation with respect to the production of any article for sale runs something like this: "Unless you are in a position to educate the public to pay for what you propose to produce, you had better produce what the public will pay for." If the producers of high test milk do not want to continue to "take the rap" for producing that product, they must either get out of that business or make the customer pay enough for their high test milk to enable them to compete on an equal basis with the producers of 3.5% milk.

That brings us to the question, "What differential would be required to enable these higher testing, lower milk producing cows to bring in the same income as lower testing, higher milk producing cows producing the same amounts of butterfat? We can answer that question by studying Rosebud and her family. (See Table 5).

Another way to determine the differential required, at any base price for 3.5% milk, to make the butterfat above the 3.5% level equal in value to that below the 3.5% level is to divide the base price by 35. (There are 35 'points' in 3%.) Hence $4.92 divided by

TABLE 5

	Value of each generation's butterfat if marketed as 3.5% milk	Amount of milk and % produced by each generation	Price required for each generation's milk to equal value of equivalent B. F. in 3.5% milk	
			Per Cwt.	*Differential*
Rosebud	$705.68	8103—6.20%	$8.71	14.03*
Daughters	687.37	7887—6.20%	8.71	14.03
Granddaughters	686.00	8475—5.80%	8.00	13.83
Great granddaughters	681.76	9006—5.40%	7.57	13.95
Great great granddaughters	729.59	9820—5.30%	7.43	13.94
Average differential required above 3.5%				13.96 or
*Differences from 14c due to dropping decimals in computing average tests				14c

35 equals .14 or 14c, the differential required to make milk testing above 3.5% worth as much as the 3.5% milk carrying an equivalent amount of butterfat when 3.5% milk is worth $4.92. As the price of 3.5% milk rises or falls, the differential would necessarily rise or fall. Thus at $2.80 for 3.5% milk the differential would be 8c. At $6.12 the differential would have to be approximately 17.5c.

Unless the farmers who breed high testers can get a market that will enable them to compete with the breeders of low testers, the conclusion seems inescapable that farmers cannot afford to breed high testers.

What's New in Electric Fencing

Condensed from Successful Farming

Charles P. Fox

SHORTLY after Pearl Harbor, one of the leading electric-fence manufacturers was asked to design an electric fence to be strung above a chain-link fence. The whole was to go around a secret Army installation deep in the hills of Kentucky.

This fence had to (1) deliver a strong but safe shock to anyone trying to scale the fence by climbing and (2) deliver a shock even though a ladder or some other means was used to avoid being grounded.

The final solution was the use of two independent circuits. Each was carried on separate wires. Anyone touching the two circuits at the same time would receive a very uncomfortable shock, even though he were not grounded. The system was a complete success. It is now used for farm fence.

The best feature of the "double-circuit" controller, is the fact that one wire may be partly or even completely shorted without lessening the shocking power of the other wire. This means that a farmer now can put the bottom wire of his hog fence low enough.

Farmers have turned to this type of controller because it permits the use of two, one-wire fences. For example: A short on the fence around an orchard will not affect the fence around a permanent pasture if the two fences are connected to different circuits.

Selecting the Controller. Contrary to popular belief, there is a difference in controllers. There's a difference in the kind of shock delivered to the fence. There's a difference in the purposes for which the various types are best suited.

You'll find that, regardless of make, all controllers fall into one of the following four classifications: (1) six-volt battery type, (2) combination highline-battery type, (3) rectifier or tube type, and (4) alternating-current type.

The most frequent of electric-fence failures is current leakage. You know it as a "short." These shorts come from weeds touching the wire, from cracked or broken insulators, and so on. The most

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effective type of controller is that which will stand the greatest amount of leakage and still deliver a strong enough shock along the fence.

Because voltage is the pressure or force of electrical current, the amount of voltage delivered to the fence by the controller determines how much the fence can be shorted, and how much pressure can be drawn off. The higher the voltage output of the controller, the greater the leakage can be.

The first three types of controllers we mentioned above (six-volt battery, combination AC–DC, rectifier or tube) fall into the same class, insofar as voltage output is concerned. All three, regardless of power source, deliver single-impulse, high-voltage outputs running over 8,000 volts.

Current values are relatively low. So there is no danger. But the high voltages make such controllers unsatisfactory for any but short, well-insulated fences.

The alternating-current types of controllers operate from the highline (or alternating current) exclusively. They differ from combination and rectifier types in that they actually deliver the alternating current sine wave to the fence. The alternating current is not converted to direct current by means of rectifiers or power pacts. Delivery of alternating current to the fence means a short series of impulses, rather than the single impulses of the first three.

Specially designed transformers in such controllers positively control the amperage to safe proportions. They increase the voltage just enough to provide the necessary pressure, but not enough to cause heavy leakage along the fence. Rarely does the output of this type exceed 2,000 volts. This accounts for the fact that the alternating-current type is not so easily shorted as the other types.

Regulations for electrically charged fences have been established by the National Bureau of Standards. Rigid construction standards for controllers have been established by the Underwriters' Laboratories, Inc. See that whatever controller you buy has underwriters' approval on it.

Building Fence. The controller should be installed according to instructions provided by the manufacturer. Don't forget that. Of all the instructions, the one of most importance is that of properly grounding the controller. Most manufacturers recommend driving a steel or copper ground rod to a depth of 6 to 8 feet into the earth. Drive it at least to permanent moisture level. Controllers should never be grounded to water systems. Nor

should ground rods be used which are already hooked up to other electrical devices.

Lightning arresters, furnished with practically all controllers, are designed to protect the controller from lightning coming in on the fence wire. They are not the type of arrester found generally in radio or electrical shops, but are heavy-duty arresters designed for electric-fence use. They should be installed outside the building but as close to the controller as possible. On longer fences, it is a good idea to install lightning arresters out on the fence. Approximately quarter-mile intervals between arresters will do your job.

The better makes of highline controllers are equipped with one-ampere fuses to protect against heavy surges of current coming in on the power line.

In cases where it is not practical to run a lead-out wire to a field some distance from the main farm, a portable battery controller probably would be the best bet.

Fence Training. Animals are controlled by fear of a fence rather than by the strength of its wire. That fear can be developed only by proper training.

Your barnyard is the logical spot for training. The simplest, quickest method is to string a barbed wire across one corner of it. Place feed on the opposite side of the wire, or tie a few ears of corn to the fence. One or two attempts are usually enough to make stock steer clear!

Finally. Let's remember that there's nothing magic about electric fencing. It's been around some 14 years. We now know how to use it properly.

If you've bought the right controller and built your fence with common sense, you'll find electric fence pays for itself on your farm any way you use it.

Efficiency Test for Hogs

Condensed from Capper's Farmer

George A. Montgomery

EYES popped. Here was a new kind of hog sale. Auctioneers and breed field men were absent; there was no harangue to pep up bidders. Pigs offered were penned by litters, and posters showed litter number at birth and weaning, weight at 56 and 154 days, feed needed for 100 pounds of gain—and price. Sales rules awarded each pig to the first man to plunk down the cash.

There was only one hitch—too many buyers wanted animals in top-performing litters. Result: Gerald Johnson, Porter county, Indiana, the owner, had to turn down many offers higher than posted price. Those not lucky took others—and every pig sold.

The hogs were Minnesota No. 1. A reporter assumed sale pace was livened by craze for a new breed. That idea faded when he found several boar buyers were market hog raisers. They sought tested sires to cross on sows of other breeds. Many would have taken a Duroc, Poland, Chester, Berk or Hampshire just as readily if they had known where to get one from a herd tested by the stiff plan Johnson follows. What they were after was stock with a proved efficiency rating that could be set down in figures like those on posters at this sale. That is something for promoters of other breeds to think about!

Buyers reasoned much like a Minnesota man who bought a tested boar of the new strain. He said: "For 25 years, my father and I have bought dairy bulls from herds improved by testing. Today our cows are high producers. That cuts the feed cost of every can of milk we sell. Our boar will sire 150 market hogs a year. Each pig from an untested sire might need 100 pounds more grain to reach market weight. At present prices, that would run feed costs up $600 a year."

The swine test in Preble county, Ohio, last year showed how hogs differ in ability to use feed. After they went off pasture at 70 days, pigs in the 3 least efficient lots needed 105 pounds more grain apiece than those in the 3 most efficient lots. The 3 best took 303 pounds feed on concrete for 100 pounds of gain; the others 373 pounds. On pasture, Johnson's best needed 280 pounds; poorest 340.

Two of the 3 most efficient lots

Reprinted by permission of Capper's Farmer, Topeka, Kansas

in Preble county were purebreds. One made 100 pounds of gain on 300 pounds of feed; the other on 308 pounds. Two of the least efficient also were purebreds. They needed 394 and 361 pounds, respectively, for the same gain. There is little doubt that older breeds have efficient and inefficient lines.

Benhart Salmela, who handles the Johnson herd, farrows litters thruout the year. He finds the earliest spring litters make faster, cheaper gains than later ones. Last year the 15 litters born in January and February averaged 230 pounds a pig at 154 days. Few late litters did that well.

With Balbo rye for winter pasture, Arthur Likes got a No. 1 fall litter of 9 to weigh 201 pounds apiece at 154 days. Only 278 pounds of feed were needed for 100 pounds of gain. At the same age 3 other fall litters at his farm in Scott county, Illinois, averaged 176 to 194 pounds, and required 271 to 305 pounds of feed for each 100 pounds of gain. Low feed consumption speaks well for Balbo rye as well as for the Minnesota No. 1 strain.

Many hog men shy away from such a program because of the extra work required. The layout used by Johnson and Likes, is patterned after that at Grand Rapids station where Minnesota No. 1's were developed. Johnson has the land used for swine laid out in a 4-year rotation. The year a field carries hogs, it is fenced into lots 50 by 200 feet. In each pen is an 8- by 10-foot house, a small self-feeder, and a water fountain.

A sow and her litter start in each pen. When pigs are 56 days old, they are weaned by removing the sow. The litter, if it has met standards to date, remains until the final weighing at 154 days.

Self-feeders and automatic waterers reduce the labor needed. A record is kept of all concentrates that go into the feeder. Work needed to move lots is reduced by use of steel posts.

Pens open into a lane that leads to a small scale with enclosed platform. Handy holding pens and lift-type gates ease the weighing job.

If a gilt fails to wean 8 growthy pigs, she and all of the litter are sold for slaughter. If the pigs consume too much feed for the gain they make, or if they fail to make rapid growth, they and the dam meet the same fate. Minnesota No. 1's have been thru such testing for 8 or 10 generations, so a high percentage of litters qualify.

Many owners of older lines of purebreds now test until litters are weaned. They find it good business. Some of them are likely to broaden their testing program to measure efficiency in the use of feed and rate of growth during the fattening period.

Factors Affecting the Fertility of a Bull

Condensed from Jersey Bulletin

Dr. H. A. Herman
University of Missouri

FERTILITY in the bull means the ability to produce copious amounts of semen containing many vigorous spermatozoa which are long-lifed and capable of fertilizing the egg or ovum of the cow when introduced into the female genital tract either by natural service or artificial insemination.

There is no one factor of greater importance to the dairy cattle breeder than fertility of his animals. Every animal that permanently or temporarily loses its fertility is a financial burden upon its owner. We would like to see breeding efficiency in every herd be approximately 100%. This means a calf from every cow every year, but it is seldom attained. There is from a small to a large loss in offspring, in time, and lowered milk production, in many herds each year. The combined total of these reproductive failures constitutes considerable loss to the dairy industry and adds to the cost of milk production. From the standpoint of the purebred dairy cattle breeder the individual animal of great genetic merit which fails to leave offspring may seriously impair the most carefully planned breeding program.

The sire is often responsible for breeding failures. These cases of lowered fertility or sterility in the sire are fairly easy to detect, since the advent of artificial insemination of dairy cattle and our growing wealth of knowledge along this line are bringing to light facts that heretofore have not been appreciated. A lack of fertility in the sire is very serious in its effect on a given breeding program and likewise on the breed, because pure-bred sires are generally carefully selected, and they are put into use with much hope and ambitous plans for their offspring. The keeping of a sire in use for many years is an accomplishment that every good breeder should strive for.

An appreciation of the most important factors affecting fertility may serve as a guide in these effects. The most important primary organs of reproduction in

Reprinted by permission from the Jersey Bulletin, Indianapolis, Indiana

the bull are the testes. It is their function to form spermatozoa. This is technically known as spermatogenesis. After the spermatozoa are formed they are stored temporarily in parts of the bull's genital tract, the epididymes which are attached to the testicle and provide for the sperm undergoing a maturing process, the seminal vesicles and the ampullae which are enlargements of the sperm tract and permit the storage of many sperm prior to ejaculation. The spermatozoa are mixed with the seminal fluids produced by the accessory glands —seminal vesicles, Cowpers, and prostate. In addition to producing spermatozoa, the testes produce hormones or endocrine substances important in the development of the male characteristics of the body, sexual interest, and no doubt regulate fertility levels.

The average semen ejaculate consists of 4 to 5 cubic centimeters (about 1-6 oz) of fluid containing from 200,000 to 2,000,000 spermatozoa per cubic millimeter. The volume of semen is affected by the size and the age of the bull. The volume of semen and fertility are not very closely related. The factors that affect fertility are briefly reviewed with such management practices as are generally recommended for the sire:

Age—The young bull 1 to 2 years of age is generally highly fertile. Though the semen volume is low, and often variable in quality, the spermatozoa are very fertile. Research indicates a steady rise in the number of services from 1 to 2 years of age when 1.5 services per calf were required, to 2.5 services for bulls over 12 years of age. Virgin heifers, it is well recognized, require more services per conception than any other age group of cows, and the practice of mating such heifers to young bulls is apparently well founded.

Rate of use—Excessive service may cause lowered fertility. The question as to what is the maximum service cannot be accurately answered because bulls are all highly different as individuals. Generally the bull should not be used before a year of age and then only 12 to 20 services the first year in use. Above 2 years of age from 25 to 35 services and above 3 years and upward 30 to 60 services. Bulls may be used heavily for short periods without harm, but a rest period must be provided. In experimental work as many as 24 ejaculations have been secured from one bull in 27 hours and the last contained live sperm. Used heavily over a prolonged period, however, investigators have shown that bulls tend to decrease in fertility. Most artificial insemination associations collect semen from each bull in

service at 4 to 8 day intervals. This seems to be a practice which is becoming firmly established on the basis of conception records, semen examinations, and ever the thought in mind of keeping the sire in service for a long time. Thus judgment is the chief factor on the part of the herd operator in determining the rate of use. It is well not to crowd the margin of safety, which nature seems to have provided, too closely.

Feeding—The nutritional requirements for maintenance of high fertility in the bull are essentially the same as those for maintaining animals in good health. The pertinent points to bear in mind in feeding and nutritional needs are:

(a) Level of feeding—Bulls should not be fat, but in good hard fleshed condition. It is well recognized that when animals are losing weight they are lowered in fertility. When they are "on the build" fertility is raised. Thus we should strive to keep a bull a little on the thin order so that we may increase feeding slightly, say at the start of a heavy breeding period. The trend in the show ring to discriminate against overly-fitted bulls is well founded. A fat bull generally has poor fertility and a lot of time is lost in thinning him down for use. The assumption is of course that "a bull worth showing is worth using." A fat condition, particularly the formation of "cod-fat" about the scrotum cuts down the blood circulation of the reproductive organs and they no doubt function at a lower rate so far as spermatogenesis is concerned.

Where bulls are poorly fed—or literally starved, particularly as youngsters, and where the feed is both insufficient in quality and low in protein, minerals, and certain vitamins, the sexual development is arrested and permanent damage may be done to the tubules of the testes and likewise cysts may form in the pituitary gland (a part of the brain tissue which is responsible for endocrine control of many parts of the body including the testes) and the bull may never be a satisfactory breeder. Older and mature bulls apparently are not adversely affected by mild starvation or poor feeding for a short while.

Judgment as to the weight and general conditions of the bull are the guide we must use in feeding.

(b) Protein—Protein is necessary in the bull's ration at a level of about 10 to 14%, or about the same as for the dry cow. Excess protein feeding can cause sterility and degeneration of the testes in certain animals, but this is not likely to occur in the bull at our usual levels.

(c) Vitamins—Most of the known vitamins are essential to

reproduction, but our usual rations of hay, grain, and pasture or green feeds, supply an abundance. Specifically we are often concerned about Vitamins E, A, and C in the bull's diet. Vitamin E is present in our grain feeds in abundance. It apparently is well supplied. Vitamin C is present in green forages, the animal no doubt can synthesize some, and in cattle its use is not too well understood, but Phillips and his coworkers at the University of Wisconsin have found lowered fertility and low Vitamin C blood values associated. In some cases the injection of Vitamin C has been helpful in both non-breeding bulls and cows. Vitamin A is necessary for successful reproduction, but it too is found in hays and green feeds and to a lesser extent in grain. Aged bulls on Vitamin A deficient diets broke in bodily health before they showed marked evidence of infertility. They recovered on proper feeding. Young growing bulls however, if not fed sufficient Vitamin A were permanently injured so far as sperm production was concerned, in studies conducted at Purdue University and the Beltsville Experiment Station. Apparently we would do well to feed our young bulls wisely and prepare them with a good strong body for a long-useful life.

The usual minerals for health and well being seem to meet all needs for semen production.

Exercise—We cannot entirely divorce exercise and feeding. To maintain a hard, muscular condition a bull needs exercise. Semen production and fertility seem to be associated with the activity of the bull. At the New Jersey Station exercising bulls resulted in increased semen volume. At the Arkansas Station exercise not only increased the volume but also the livability of the sperm under storage conditions. Exercise may be obtained by allowing the bull to run loose in a lot on pasture Not all bulls will take sufficient exercise this way. Mechanical exercisers may be of value. One of the artificial insemination associations in Missouri exercises every bull 30 minutes before attempting to collect semen. This practice seems to result in the bulls being more"pepped up" and they serve readily with larger volumes of semen than when not exercised beforehand.

Seasonal Temperature—The season does not seem to have a marked effect on fertility levels in the bull. Cattle are not seasonal breeders, but there are no doubt constitutional or health factors associated with prolonged drought and extreme temperatures which result in slightly lowered fertility. This may be ac-

counted for perhaps by changes in body condition, loss of weight, etc., but also changes in the endocrine (or hormone) system which brings about lower fertility.

Bulls in Missouri produce lower quality semen in August and September than in other months. Heat may be a factor as it is definitely known that the scrotum is several degrees lower in temperature than the rest of the body, and if these lowered temperatures are not maintained sterility may result.

Recently Mercier and Salisbury reported a correlation between the length of day and intensity of light and fertiliy in cattle in Canada. Cows bred during the shorter days—winter and spring—had a lower conception rate than those in summer and fall.

Injury to Testes—Disease, etc. —Mechanical injury to the testicles often results in permanent injury to the tissues which produce the spermatozoa. Bruises, inflammation, etc., generally result in a feverish condition of the scrotal tissues and sperm formation is retarded or halted entirely, resulting in temporary to permanent sterility.

Brucellosis infections of the scrotum likewise may cause lowered fertility. Likewise diseases such as anaplasmosis and ailments such as foot rot, hoof-and-mouth disease may cause lowered fertility. These changes seem to result from increased body temperature more than any actual ravages of the diseases.

Thus we can say that the factors controlling a healthy, thrifty, hard-muscled condition in the bull are those which have the greatest effect on fertility. Management as it concerns exercise, prevention of disease, prevention of injuries, rate of use of the bull, and level of feeding cannot be overlooked and are controllable by man. A bull's primary purpose in life is to produce spermatozoa —the kind from a genetic standpoint we govern as far as physically possible when we choose that bull. Maintaining that sire for a long period of usefulness and the production of highly fertile spermatozoa is an obligation not to be taken lightly.

Unreckoned Profits From the Feedlot

Condensed from the Hereford Journal

Dr. Carl W. Gay
Dept. of Animal Husbandry, Ohio State University

THE agricultural economist usually finds dairying more to his liking than beef production and the reason seems to be that he has difficulty in figuring a tangible profit from the feedlot operation. An economist's conception of profit is usually the difference between cost and selling price of the cattle, or what is generally known as margin to the feeder. The latter knows that not all beef-making enterprises show such a profit.

How a cattle feeder can sell his finished cattle at what those cattle cost as feeders and still find it a profitable experience seems beyond the comprehension of the technical economist. It just does not make sense to him and he may even doubt that it can be done.

A prominent Ohio agricultural economic expert spent all morning on a tour of inspection of cattle-feeding plants in a leading Ohio county. He had heard the owner tell what the cattle cost laid in the feedlot, how much they had gained and the cost of those gains, then heard from a market representative what they would have brought on his market as of the previous Monday.

In most instances this figure was a substantial advance over the selling price necessary to break even. Even in the light of this most convincing evidence, the economic mind was tight shut by a traditional prejudice against cattle feeding. In the meeting which followed the tour, this speaker devoted his effort to convincing his hearers, many of whose feedlots he had visited, that they were not making any money feeding cattle. Yet many of these people owned fine farm homes with cattle feeding the chief source of income.

This is not meant to be an indictment of all agricultural economists, many of whom have made most important contributions to the practice of farm management, but there are some who have not learned that there are certain things that cannot be figured out with pad and pencil and that beefmaking is one of them.

Cattle feeding has been desig-

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nated the redheaded stepchild of animal husbandry. No other livestock enterprise, except horse racing, has been so severely condemned by some agricultural counselors. This is principally because of the unreckoned profit, which, like the traveling salesman's overcoat in his expense account, may not show but is in there just the same.

The other objection is that cattle feeding is too highly speculative to be recommended to livestock farmers. It is speculative as practiced by some and heavy losses have been incurred in consequence. On the other hand, some of the most notable successes in livestock farming have been attained by cattle feeders.

If one raises his own feeder calves, feeds his own farm-grown feeds according to approved feeding practices and to the grade of his cattle, makes the most of the hog's return on the feed passed through the cattle, handles the manure in such a way as to restore to the soil maximum fertility, and markets to best advantage, he can take all, or practically all, the speculation out of beef production.

There is much more to cattle feeding than shows on the ledger sheet. There are four possible sources of profit. The major operation may return a two-fold yield, one on the resale, at an advance, of the initial weight of the cattle fed. This is made possible by the enhancement of carcass value of the original weight through fattening. The other profit on the major operation comes from the sale of the gains in weight of the cattle resulting from the feeding process. It is true that in older cattle the cost of these gains may equal or even exceed the price they sell for. However, the sale of gains is an item of possible profit and they can sometimes be made so cheaply that they become the source of profit when the cattle fail to sell at a margin over cost.

The other two sources of income are by-products of the principal objective in fattening cattle, viz., the pork credit and the manure. Either may be of sufficient importance to keep the livestock farmer in the cattle-feeding business. These are the profits two often ignored in the economist's calculations.

It is the rule to salvage the corn that passes through the cattle indigested by means of hogs following the cattle. There may be possible exceptions, as when ground corn, which is more completely digested, is fed, but even then hogs derive a considerable feed value from the cattle droppings and the practice is considered profitable though the hogs

may require additional feed in creeps to make satisfactory gain.

The amount of the pork credit will depend, as already indicated, upon the form in which the corn is fed, shock corn affording most feed for the hogs, then snapped, ear, shelled and ground corn in order. The age of the cattle also influences the pork credit, young cattle digesting their feed more completely than older cattle thereby leaving less for the hogs. The amount of the ration fed also is important, a heavy ration being less completely digested than when the animal is called upon to handle less feed.

The relation of the form in which corn is used and the age of the cattle, to the pork produced is reflected in the following guide to the allotment of hogs per steer:

Taking shelled corn, as a base, the usual rule is one pig to one steer if two years old; one pig to two steers if yearlings and one pig to three steers if calves. When the ration is ear corn the number of pigs can be doubled while if corn in the form of corn-and-cob meal is fed the droppings will support only from one-half to one-third as many pigs.

The contribution of the hogs following the cattle to the efficiency of the feed-lot operation is revealed by the following figures:

The average pig following 1.9 steers on shelled corn for 120 days salvaged 312 pounds of corn thereby saving 4.7 percent of the cost of the feed to the steer. From 1½ to two pounds of pork were produced for each bushel of corn fed to the cattle. On corn-and-cob meal the pork credit was reduced one-half; but even with the cattle on silage the hogs gained one-half to three-fourths pound per bushel of corn in the silage.

Hogs after heifers are not a good combination as the hogs often lacerate the heifers about the external genitals. The damage is done when the heifers are lying down so some feeders shut the hogs out of the feedlot at night to minimize this hazard.

The remaining source of profit, a by-product of the feedlot, is the manure. Here again the value of the by-product depends upon the age of the cattle and what they are fed.

Steers old enough to have made most of their growth before going on feed undergo a straight fattening process, i.e., their gains are almost entirely in fatty tissue. Fat does not contain the fertilizing elements of nitrogen, phosphoric acid and potash, familiar reading on fertilizer sacks; therefore a large part of these constituents of the ration of mature fattening cattle is returned to the land in the manure. However, in feeding

calves, growing and fattening are going on at the same time, and growth includes bone, muscle and blood, all of which are high in nitrogen, phosphoric acid and potash, also calcium in bone and iron in blood. As a consequence, these elements in the feed are used by the growing calf and smaller amounts are contained in the manure. The fertility value of manure from three-year-old cattle is, therefore, much higher than that of calves.

Then, too, if the ration is chiefly corn and timothy hay both its protein and its mineral content wil be much lower than if it consists of an oil meal or tankage supplement to the corn, and alfalfa instead of timothy hay.

Fortunately, the practical means of handling feedlot manure is an effective way of preserving its elements of fertility. Many feedlots are only cleaned out at the conclusion of the feeding period or in time to get the manure on the corn ground before plowing. Others may be cleaned out oftener if the rising level of manure is not compensated for by adjusting the height of the feed bunks so as to keep the hogs out of them.

The result of allowing the manure to accumulate is that the droppings are thoroughly worked over by the hogs, fresh straw being added frequently and the whole mass being firmly packed by the tramping of the cattle. Little fertility gets away from manure kept in this condition and if it is promptly taken to the field and plowed under, once the compact mass is broken up, the whole program provides an efficient means of maintaining soil fertility. Not only is the fertility that has been taken off the land in the farm-grown crops fed, restored to that land to maintain its fertility but the purchased protein supplements and alfalfa, if any, all high in plant food value, actually build up the fertility of the farm where cattle are fed by adding fertilizing elements derived elsewhere.

No one knows the value of feedlot manure better than the Lancaster County, Pennsylvania, farmer. While these farmers feed more cattle than do farmers in any other county in any state in this country, they are not cattlemen at heart but tobacco growers. Since tobacco is a soil-depleting crop the cattle are a means to a tobacco end via their manure.

Any farm-real estate salesman who knows his business will make a strong point, in his sales talk, of the fact that cattle have been fed on the farm in question for a number of years and it is, therefore, more productive.

The situation with respect to the influence of cattle feeding on soil fertility is well expressed by the following experiences: A group of Ohio cattle feeders was visiting a feedlot in Fayette County in which the visitors saw a nice lot of baby beeves just sold to go to the Buffalo market. The owner had narrated to the group the initial weight and cost of the cattle laid down, the cost and amount of gains and selling price.

There was no spread or margin between cost and selling price and that fact bothered some of the economic-minded persons present who called it to the feeder's attention. His prompt reply was signficant.

"Gentlemen, I never made any money feeding cattle but I never made any money farming until I did feed cattle."

On the same tour, the same inquisitors were not satisfied when another feeder told the whole story and even drove a draft of his calves on the scales to show what they had gained. Those figuring economists wanted to see his books.

The feeder's reply was right to the point:

"It's all right to go to the house and look over my books but if you want to find out what my profits from cattle feeding are, don't go to the books but go over in that field and husk out a half-dozen shocks of corn."

We never have a complete, over-all picture of a beef-making operation until all four possible sources of profit are reckoned.

How to Handle "Cannibal" Sows

A little psychology and a big pitchfork will usually solve the problem of cannibalism in sows, according to midwestern veterinary authorities. Here is their advice on what to do to keep sows from fighting and eating the baby pigs: Just as soon as the pigs are farrowed, remove them from the sow and place one in a corner of the pen, protecting it with a pitchfork. Confronted by the fork, the sow will approach the pig with caution, will take time to smell it, and within a few minutes she will become accustomed to it. After that, the rest of the litter can be placed in her care, with relatively little danger that she will attack them.

—Hog Breeder

So You Have No Erosion

Condensed from the Michigan Farmer

R. G. Hill
Extension Conservationist, Michigan State College

"I HAVEN'T any erosion on my farm but you should see my neighbor's fields," remarked Alf Jones at a recent soil conservation district meeting.

This statement was not original with Jones for not more than 5 minutes before I had listened to the "neighbor" tell about his drainage ditch that was plugged with top soil from the Jones' farm. The "neighbor" hastened to explain, however, that his fields had no erosion.

Erosion taking place over the fence was more evident to each of these men than that occurring on his own farm. It is a situation heard many times.

How severe is erosion on your farm? What does it mean in terms of income? Each land occupier should ask himself those questions about his own farm.

During the past year newspapers carried numerous stories about the cost to the tax payers each year for dredging silt out of harbors.

United States army engineers with the assistance of the United States Soil Conservation Service made a check on the Saginaw River this spring during the flood and found that it was carrying a load of 43,000 tons of soil by a given point each day. Where did this soil come from? An increasing number of "level" land farmers in the thumb are recognizing that even so-called level land loses soil by running water. These farmers are becoming increasingly alarmed about such losses and what's more are doing something to stop it. Also this spring the Grand River at Grand Rapids was carrying 55,000 tons of top soil every day. That's a loss of 6 inches of top soil from 55 acres every 24 hours. Nearly every stream and drainage ditch that runs through cultivated farm land could tell a similar silting story.

Almost everyone will remember when, as a boy or girl, after having found the hidden candy sack, they proceeded to sample it one piece at a time with the idea that mother wouldn't notice such a small loss. But the inevitable

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August 7, 1948, Detroit, Michigan

day arrived, since, after all, there was only a certain quantity of candy.

The action of erosion on unprotected fields is similar. A small "bite" of soil removed by each rain is not noticed until after a time when thin grain, short corn or light hay becomes noticeable; or perhaps it's the chuck of a combine, the scraping of a corn picker, the shifting of a hay load as the wagon runs over a rough part of the field, or the pull on a tractor as the plow hits hard spots, that may cause one to realize that perhaps something has happened to the top soil.

The amount of water erosion occurring on land is being measured by runoff plots in several soil conservation districts. Michigan State College in cooperation with the U. S. Soil Conservation Service is also checking runoffs on the college farm. The results are startling. One has to see the piles of fine top soil—the most productive part of the farm—that has collected, the muddy water being trapped, and the amount of water actually running off to really appreciate what is happening on Michigan farm land. Take the college farm. Robert White reported a year ago that in a 24-hour period during which 2.7 inches of rain fell on 5% slope (5 feet of fall in a 100 feet) a corn field with a rye cover crop lost one-half ton of top soil per acre while a brome alfalfa plot adjacent to the corn lost no measurable soil during the 24 hours. It was conservatively estimated that Michigan corn fields lost over one million tons of top soil that one day. The loss from wheat and rye fields drilled up and down the slope was believed to have been as great if not greater.

Runoff plots in the Fenton Soil Conservation District show that in 3 years, fields cultivated up and down a 7% slope lost 40 tons of soil per acre, while fields worked across the slope lost only 7 tons during the same period. In addition the up and down cultivated slopes lost from a third to one-half of the rainfall which fell during June, July and August —water which the crops could have used to advantage.

In the Lapeer district in 1946 on a 9% slope, similar runoff plots showed that a field cultivated with the slope lost 4 tons of top soil per acre as compared to one ton per acre where erosion control practices were used. A meadow plot nearby lost only one-fourth ton per acre.

Wind erosion losses are believed to be equally great in some localities. Reliable facts about losses due to wind are not available. However, thousands of acres of Michigan land have become

uneconomical to farm largely because wind erosion was not controlled. Many farms suffer soil losses from both wind and water.

What do these losses mean in terms of farm income? The MSC farm management department has repeatedly shown that yields of crops and farm incomes are directly related. No doubt most farmers would substantiate that conclusion. Therefore, farm practices which increase crop yields may also increase the farm income. Experiments on the runoff plots in the Tuscola Soil Conservation District during 1947 showed that beans planted across the slope yielded nearly 2 bushels more to the acre than beans drilled up and down the slope. Loss of water during June, July and August was approximately 40% of the total rainfall on the beans planted up and down hill, as against a loss of less than 10% where the beans were planted and worked across the slope. Similar plots in Livingston County showed an increase of 8½ bushels of corn to the acre over a 5-year period on plots that were contour planted as compared with the ordinary method of up and down cultivation.

New York state reports an increase of 37 bushels of potatoes per acre where the crop was planted and worked on the contour. Even greater increases in yields have been reported by Michigan potato growers who have applied erosion control practices.

The New Jersey experiment station reports that tests between 1944 and 1946 showed yields of 4 bushels per acre of soybeans on fields eroded less than 6 inches of top soil. While uneroded, 6 inches or more top soil, produced 18 bushels per acre. Potatoes on the first soil produced 257 bushels per acre, while those on the second resulted in 327 bushels per acre. Other crops resulted as follows: Oats, 21 bushels against 32 bushels per acre; wheat, 22 and 32; alfalfa, .9 tons per acre against 1.4 tons per acre.

Tests at the Indiana experiment station showed on 12 inches of top soil, experts received 69.5 bushels of corn; 10 inches, 56 bushels; 8 inches, 53 bushels; 6 inches, 47 bushels; 4 inches, 39 bushels; 2 inches, 30 bushels; and from 0 to 1 inch, 19 bushels.

Both these experiments clearly indicate what happens to yields as erosion progresses.

It has been repeatedly pointed out by various writers and soil conservationists that as cultivation continues the rate of erosion increases. As yields of crops decline it becomes necessary for land operators to farm that land

more intensely in order to secure sufficient income and the rate of land deterioration may therefore increase. The loss not only affects the immediate crop but yields for many years into the future. Fruit growers in particular realize this long time significance of erosion on production and life of orchards and are doing an outstanding job in reducing soil losses. One of the significant pieces of research on the effect of applying soil conservation practices was carried out by the agricultural experiment stations in Ohio, Wisconsin, Iowa and Illinois in cooperation with the United States Soil Conservation Service. Some 314 farms were studied to find if a relationship existed between farm income and the application of soil conservation practices. These stations reported that the increase in income on farms using a large number of soil conservation practices as against farms using few conservation practices averaged $725 per farm per year in Ohio, $604 in Wisconsin, $568 in Iowa, and $1464 in Illinois. It should be pointed out here that production practices such as fertilizer, lime, green manures, cover crops were considered as well as erosion control measures.

Dr. H. H. Bennett of the U. S. Department of Agriculture during his recent MSC Farmers' Week address stated that "9000 farmers throughout the United States who keep accurate records reported that conservation farming for 2 years or longer had increased their per acre yield of major crops by nearly 36%. Included in this group were 99 Michigan farmers who reported about a 30% increase in yields."

Certain conclusions become evident. It is estimated that we have lost between a fourth and a third of our top soil. As we continue to cultivate erodable land without checking soil losses the rate of erosion increases. The losses from wind and water erosion may occur so gradually that we are unaware of the loss until yields materially affect farm income. It must be recognized that we have few new lands to bring into production and that the number of mouths to feed and bodies to clothe are steadily increasing. It is a problem which affects not only the farmer and his immediate income but also the future health and security of every single individual. Erosion and the subsequent loss of soil productivity must be halted.

New Test for Weevils

Condensed from the Farm Journal

Up to now, we haven't paid much attention to cleaning up weevils in our wheat or corn. The weevils have cost us 5% of the crop, but that didn't seem alarming.

Now it may be different. For it has just become possible to tell, with a simple new test, just how many weevils may hatch out in a bin of wheat or sorghum, or a crib of corn—and it's usually been far more than suspected.

Similar tests are now being tried on other grains.

Millers and other buyers at the grain terminals will soon be using this test, and are getting ready to knock down the grade (and price) on infested grain accordingly. From here on, weevils won't cost you just 5% of your grain—they may cost you a lower grade on the whole crop.

Weevils make two kinds of punctures in a kernel: one to eat, the other to lay eggs. The eating punctures don't do too much damage.

But the egg punctures contain the makings of future weevils. These punctures are sealed over with a waxy substance, invisible to the eye.

A few days later the eggs hatch. Then the tiny grubs inside the kernels begin eating, and soon make hollow shells of the kernels.

Whoever is holding the grain—farmer, miller, or feed manufacturer—takes an unexpected loss. That loss is not only in the weight of the grain. For a miller, it may be the loss of the flour he makes, if enough weevil fragments are found in it.

But here's where the new test comes in. When you soak a sample of grain for just a few minutes in a solution of two common chemcials (acid fuchsin and glacial acetic acid) the wax plugs covering the eggs turn a cherry red!

Now, for the first time, it's a simple matter to see, *before you buy* the grain, how much weevil trouble you're running into.

Naturally, that's going to affect the price—maybe not much in a year when demand outruns supply, but certainly when it's the other way around.

The test was developed at Manhattan, Kan., in May, by J. C. Frankenfeld, USDA entomologist. When it was described in a recent speech before the As-

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sociation of Operative Millers, it was a bombshell.

The millers promptly went home and put their own chemists to work making tests. And they also began to make plans to seek changes in Federal grain standards, now based in part on the number of live weevils found in a sample.

"We're hoping that weevil-infested wheat will be graded in such a way that it won't be profitable to mill it or to grow it," said Donald S. Eber, secretary of the Association of Operative Millers.

Even without such changes, it's still good business to prevent damage from weevils and other insects that attack stored grain. These bugs destroy 5% of our grain crop every year—devouring it at a rate of 1% a month for at least the first five or six months it is in storage. *That's enough to fatten 10 million hogs. It's nearly half as much wheat as we'll send to Europe this year!*

These losses usually begin while the grain still is on the farm. Grains can be weevil-infested right in the field. Some weevils live in the shattered wheat from previous harvests.

Fortunately, farmers can largely prevent weevil damage. Here are three things to do, says the USDA:

1. Sweep down the walls of grain bins. Get rid of all old grain, and all old milled products near (including under) the bins. Burn, fumigate, or sterilize old feed and grain bags. Don't let old grain remnants stay around the place where new grain will be stored.

2. Spray or paint walls and floors of wooden bins with an insecticide that leaves a residual coating. If you use DDT, use a 2½% concentration, two gallons of spray per 1,000 square feet of wall and floor surface.

3. Fumigate all wheat in bins *in August*. If your bins aren't tight enough for fumigation, line them with fiber-reinforced paper. Use a 3-to-1 mixture of ethylene dichloride and carbon tetrachloride, or a 1-to-4 mixture of carbon disulfide and carbon tetrachloride.

In steel bins, use three gallons of the 3-to-1 mixture, or two gallons of the 1-to-4 mixture. In tight, non-steel bins, use twice as much. If the bins are loose, use more than that.

The surface of the grain should be at least six inches below the top of the bin, and level. Spray the fumigant evenly over the grain. Use a bucket pump or some other kind of sprayer. Even a sprinkling can may be used.

Don't get into the bin if you can help it. Don't breathe the vapors, even if you have to hold your breath and come out for air. To be absolutely safe, wear

a gas mask. (You can buy one at a mine supply or industrial safety supply house in larger cities.) Don't spill the fumigant on your clothes or hands.

Although fumigation will kill weevils, grubs, and eggs, there's always the danger of re-infestation. Therefore, the USDA recommends that if you carry your grain until spring, spray it again when warm weather starts.

And if you store unsold grain in a country elevator, it's worth the price to have your grain fumigated there, too.

Better Swine Feeding Methods

Condensed from American Hampshire Herdsman

Dr. J. A. Hoefer
Purdue University

FEEDING livestock is just about the biggest job the Indiana farmer has, as indicated by the fact that from 70 to 75 cents of every dollar he receives comes from the sale of livestock and livestock products. More specifically we might point out that the nutrition of the pig assumes great significance when we observe that almost half of this livestock income comes from the sale of market hogs, or from 30 to 35 cents of every dollar income the farmer receives.

Let us make several assumptions and consider how these hogs might be fed in order to take them from weaning to a market weight of approximately 225 pounds, which is a better market weight for the hog than the 250 to 300 pounders that we see all too frequently on our markets. It has been well established in numerous experiments that when corn alone is fed, it takes approximately 12 bushels of corn to make 100 pounds of gain on a fattening hog. This would mean about 24 bushels of corn to make a market hog out of a weanling pig. It has been also equally well established that under excellent feeding and management a hundred pounds of gain can be produced from 5 to 6 bushels of corn plus 40 to 50 pounds of the right kind of supplement, or approximately 11 bushels of corn plus 100 pounds

Reprinted by permission from the American Hampshire Herdsman, July 1948, Peoria, Ill.

of supplement to produce a market hog of 225 pounds.

Great savings can be made by proper feeding, and there is plenty of evidence to indicate that we could do a better job of feeding hogs. It has been reliably reported that less than 50 per cent of our swine and poultry are fed balanced rations.

We should increase our efforts to bring about improvement on the part of the inefficient feeders. It is tragic at this time to waste feed by feeding unbalanced rations or by feeding animals to excessively heavy weights.

Before we consider the nutrition of the hog in more detail it might be well to consider certain fundamental facts which influence swine feeding. Corn and hogs and therefore concentrates and hogs are inseparable. A map of the corn belt and a map showing swine population are practically identical. Corn and total concentrates make up about 80 per cent and 95 per cent respectively of the fattening hog's ration. The need for a swine supplement is based logically on the need to make up or supplement the deficiencies of corn, and any supplement which fails to take this into account is an inefficient one. The deficiencies of corn are of course protein, both quantity and quality, minerals and vitamins.

It should also be recognized that the hog being monogastric has a protein and vitamin requirement which differs greatly from that of the ruminant, which has a fermentation vat to supplement its dietary protein and vitamin supply. For efficient results the hog must be fed protein of high quality, that is protein which supplies the right kind of amino acids in adequate amounts and in proper balance with one another. Which of the 22 or 23 amino acids are essential for swine? We don't know yet, but we think the requirements are qualitatively similar to those of the rat and of poultry. We are making progress in this direction and we hope that in the not too far distant future we will be able to state first qualitatively, and then quantitatively the amino requirements of swine. When that day arrives much of the guess work in meeting protein requirements of swine will be eliminated.

In common with most other animals swine require the fat-soluble vitamins A and D. Vitamin E is also required but the amounts are unknown. It is not likely to be deficient however because this vitamin has a wide distribution, being found in most of our common foodstuffs. With regard to the so-called B-complex vitamins the story is a little different. Many micro-organisms have the

ability to synthesize the B-vitamins, but in the case of swine the amount of effective synthesis which takes place in the digestive tract is very limited. By using synthetic diets it has been demonstrated that the following B-vitamins are required by swine: thiamin, riboflavin, niacin, pantothenic acid, pyridoxine, choline, biotin, inostitol, and folic acid. Of these it would appear that riboflavin, niacin, pantothenic acid and choline are of the greatest practical importance.

With regard to the mineral needs of swine, it should be borne in mind that when the bulk of the ration is corn, or other materials of plant origin the chief deficiencies are calcium and salt. Corn is notoriously low in calcium and only fair in its phosphorus content; the plant protein supplements are also low in calcium but are good sources of phosphorus. The results obtained in recent experiments at Purdue with reference to salt feeding are striking testimony to the important role played by this simple mineral. Salt feeding is frequently neglected because it is a very common opinion that while salt is essential for cattle and sheep it may be omitted from the swine ration. Scientific research has established that there are at least thirteen essential mineral elements, but that doesen't mean that all thirteen need to be included in the mineral supplement. The evidence available today would indicate that the following elements may be of practical concern to the swine producer: calcium, phosphorus, sodium, chlorine, iodine, and iron (copper). The first can be easily supplied by a simple mineral mixture which includes stabilized iodized salt. Iron and copper deficiencies are limited to suckling pigs kept indoors and can be prevented very effectively by placing uncontaminated sod or dirt in the pen or by applying a solution of ferrous or iron sulfate (copperas) to the sow's udder daily. The other essential mineral elements are usually supplied in adequate amounts by the rest of the ration and there is no justification for including all of them in a general purpose mineral supplement.

The problem of swine feeding is no longer simple but complex, and a complex problem usually calls for a complex answer. The answer of course depends upon the existing conditions, and these must be considered when formulating the ration. The major conditions may be listed as follows: (1) dry lot, (2) pasture, (3) gestation, (4) lactation, (5) weaning to 75 pounds, (6) 75 pounds to market weight.

Most researchers are pretty well agreed now that the most

critical feeding conditions or periods are gestation, lactation, weaning to 75 pounds in weight, and dry lot. Our feeding problems are usually well taken care of when our hogs are on good pasture or have reached approximately 75 to 100 pounds in weight in a thrifty condition. To the workers at the Illinois Experiment Station must go much of the credit for studying the critical requirements for reproduction and early growth. The Illinois workers and investigators at other stations have found that during these periods of greatest nutritional strain, such as dry lot, during gestation, and early growth, that certain adjustments must be made in the ration if optimum performance is to be attained. The literature contains many reports of the importance of including some animal protein and a fairly high percentage of high quality alfalfa meal (10 to 15% for reproduction) in the ration. Apparently the problem is not simply one of amino acid balance or quality of protein but is more likely related to the water-soluble vitamins and possibly some unidentified factors. Feeds other than alfalfa which are known to have protective functions during these critical periods are distillers' solubles, condensed fish solubles and liver. These feeds and others are being subjected to much intensive and critical research in an effort to discover what nutritional factors they contain that seem to be so essential for normal reproduction and early growth.

An interesting development from these recent experiments is the recognition of the importance of the previous treatment or history of the animal prior to the start of the experiment. It is necessary to control or at least to know the previous history if the experimental results are to be interpreted correctly.

The most practical and effective recommendation that can be made for feeding breeding hogs is to make maximum use of good green pastures. Good pastures will correct a multitude of dry-lot feeding sins. The emphasis today, and rightly so, is being placed on soil conservation which means increased acreage of pasture and forage crops. I think that in the past we have underestimated the grazing ability of the brood sow. We should intensify our efforts toward developing improved hog pastures and increasing the length of the grazing season. Success along this line would result in a marked decrease in the present 30 to 40 per cent pig mortality. One should not lose sight of the fact that every pig lost at farrowing represents 100 to 150 pounds of feed. Also if we raise one more

pig per litter over the average (6 for the country) we literally double our opportunity for profit.

Pastures can be used to a definite advantage for fattening hogs as well as breeding hogs. Numerous experiments have shown that good pasture will save from 10-15 per cent of the concentrates and up to 50 per cent of the protein supplement.

When pastures are not available because of the season or when the program calls for the production of hogs under dry lot conditions, the feeder needs to pay particular attention to his ration. The gestation ration should contain at least 10 to 15 per cent alfalfa, a protein supplement including some animal protein, and adequate mineral, especially calcium, phosphorus and iodized salt. According to the recommendations of the National Research Council's Committee on Swine Nutrition, such a ration should contain 15 per cent crude protein, .60 per cent calcium and .40 per cent phosphorus.

How much alfalfa should be fed to growing and fattening hogs in dry lot depends partly on price relationships. Probably not less than 5 per cent and not over 15 per cent should be fed. Some experiments have shown that at the 10 per cent level the rate of gain is not greatly affected and under some conditions the gain may be produced at less cost. The ration of the 100 pound growing fattening pig should contain 16 per cent crude protein.

Birth of New Farm

Condensed from Soil Conservation

Barrington King
Soil Conservation Service

Sixty thousand people saw an old farm take on the new look down in the Oconee River Soil Conservation District in Georgia.

It was the biggest of a long series of farm "face liftings" that have been held throughout the country. Six months of planning preceded the smooth-running demonstration. More than a million dollars' worth of farm equipment was in operation. Seven hundred persons, including ma-

Reprinted from Soil Conservation, August 1948, Washington, D. C.

chine operators and 300 GI agriculture trainees, helped with the various jobs.

Probably the only thing that hadn't been anticipated by those who put on the show was the size of the crowd. Parking space had been optimistically provided for 14,000 cars, but the space soon filled up and the cars overflowed to adjoining areas.

Operations continued without let-up through the lunch hour and speaking program that followed on top of a hill overlooking the farm. Chief H. H. Bennett of the Soil Conservation Service, one of the feature speakers, compared the operations going on around them with the building of the pyramids. This work was more important he thought.

"The pyramids were built to commemorate the dead. What we are doing here today is seeing a vision of the future," he said. "Twenty-five or thirty treatments are being applied here according to the needs and capabilities of the land. We can't afford to lose any more of our diminishing supply of good land that is needed to feed an increasing population."

By early afternoon, the 168-acre farm of Marion H. Carlyle and his GI nephew, Ernest C. Blakey, was beginning to undergo a tremendous transformation. Wherever visitors looked, heavy and light tractors, road patrols, terracing machines, land clearers, subsoilers, and cultipackers were busily engaged in their assigned duties of remaking portions of the farm under direction of SCS technicians.

Bulldozers that cleared land for pasture were followed by fertilizer distributors, lime spreaders, and seeders. Earth scooped out of a little valley and built into a dam was soon backing up water in a 2-acre fish pond that was partially stocked with fish during the afternoon. A yawning 50-foot gully had completely disappeared before the day was done.

Winding terraces began to appear in cultivated fields, meadow strips were shaped and seeded, land was prepared for alfalfa and rotated crops, woodland areas were thinned, steep land was planted to kudzu and sericea, new wire stretched between new cedar posts glistened in the sunlight. A new metal barn had been erected and the farmhouses had a fresh coat of paint.

District Conservationist R. L. Dolvin, who supervised planning and directed technical operations, thinks the most significant comment on the entire demonstration was an unwitting compliment paid by one of the visitors. Looking out over the beehive of activity on the 168-acre farm the visitor said to Dolvin, "You know, it's really remarkable how some-

thing as big as this can run so smoothly without any supervision."

It was a tremendous undertaking—this remaking of an eroded farm in a single day. It required a lot of planning, working, and cooperating on the part of everyone. But for the 60,000 visitors who went away with a new conception of the possibilities of conserving their irreplaceable soil resources, its benefits will go on for many years to come.

Have You Made Your Will?

Condensed from the Agricultural Situation

Esther M. Colvin
Bureau of Agricultural Economics, U. S. D. A.

THIS is an important question. Maybe you've been putting it off because you haven't known just how to go about it. Perhaps you're superstitious and feel that making a will is inviting disaster. Or possibly you are not aware of how your property will be distributed under the laws of descent of your State in case you do not make one.

Making a will means that your property will be divided according to your wishes. It can mean that the farm you've spent the better part of a lifetime in building up will continue in operation as an economic unit instead of being broken up into tracts too small to support a family.

Wills are especially important to farmers. Ordinarily, most of their assets are tied up in land, livestock, machinery, and tools. Sales to settle estates of this kind are uneconomic; they destroy the going-concern value of farms by scattering the machinery, livestock, and other forms of capital. A farm owned jointly by several heirs presents problems of management; all too often friction develops.

Despite all these things, scattered studies indicate that the majority of farmers do not leave wills.

Unless your will is to be very brief and in very simple form, you will be wise to consult a lawyer. The will must be written. In most States, you must sign it before witnesses. Some States require two witnesses; others specify three. Your will may be changed as your family changes by marriage, birth,

Reprinted from the Agricultural Situation, August 1948, Washington, D. C.

or death, or as your economic position changes. It is important to make these changes. Otherwise, you may work hardship on your heirs.

You may will your property to whom you please and in any way you please, with two exceptions. You cannot will away the dower rights of your wife and you cannot impose restrictions upon future generations. In most States, dower rights amount to a life interest in one-third of the husband's real estate. A few States also provide for courtesy rights to the surviving husband. These are similar to dower rights.

The laws of descent differ among States, but in general, here are the things you want your will to do:

(1) Provide security for your wife during the remainder of her lifetime. Willing the land to her means that she can keep her home. You may will your property to your wife in fee simple. In this way she will have absolute title, and she may sell or give it away or she may dispose of it by will. Or, you may specify that she is to have the property as a life estate, that is, she is to have the use of it during her lifetime but she cannot sell it or give it away and she may not dispose of it by will.

(2) Provide equitable (this does not always mean equal) treatment for your children or your other heirs. You may have given some of your children more schooling than others. Perhaps you have a son who has stayed on the farm to manage it and to take care of you and your wife. Certainly he has a greater interest in your farm than have your other children. It is possible to provide for him with a father-son agreement.

(3) Transfer ownership of your property in a way that will cause as little friction and uncertainty as possible.

(4) Make sure that the resulting ownership pattern will not mean exploitation of farm resources and inefficient use of the land. Suppose your farm of 350 acres were divided into five separate farms. Except in areas of very intensive cultivation, these farms would be too small to be efficiently operated. Arthur J. Walrath and W. L. Gibson, Jr., in Farm Inheritance and Settlement of Estates, Virginia Agricultural Experiment Station Bulletin 413, January 1948, say that there is little doubt that the small farm problem in many parts of Virginia has developed in part from equal subdivision among heirs.

You may use one of several other methods of disposing of your property. If your children are small, you may want to leave your entire estate to your wife in fee simple. If title to your farm is held jointly with your wife and if it provides for the right of survi-

vorship, upon your death she becomes full owner. Otherwise, each of you hold a one-half undivided interest and your half becomes a part of your estate.

You may dispose of your farm and your other assets by gift if you wish, although it is a rare farmer who can afford to distribute his property during his lifetime. You and your wife may make interest-bearing loans to each of your children, with provision in the notes that all or a stated amount of the indebtedness is to be cancelled automatically within a stated period following the death of whichever parent lives the longer.

Another way is the annuity method which allows an owner to turn over qualified ownership of land to his children and yet to retain annual income rights for himself and his wife. Annuities are not yet in extensive use.

A will is by far the best way of guaranteeing that property will be disposed of in the way you wish. If you do not make a will, your heirs may become involved in a chancery suit. It may be years before your estate is settled. Hard feelings may develop among your children. The farm as you have known it may disappear into small uneconomic parcels of land.

Full-Feed For Lambs

Condensed from Iowa Farm Science

C. C. Culbertson

OVER-EATING disease has kept a lot of Iowa farmers from self-feeding their lambs. Enterotoxemia is the technical name for it. We don't know much about it; but we know some lambs die from it when they are self-fed on corn.

Recently the Colorado Station found that mixing a little flour sulfur in the grain ration helped to prevent losses among lambs that were being fed heavily on grain. Last fall we carried out a feeding experiment with lambs that gave the same results; we got no deaths from "over-eating" when we fed sulfur along with the ration.

It takes grain to make lambs fat in the shortest possible time. Here in Iowa this usually means corn. The sooner you can get your lambs on a full feed of corn the

Reprinted from Iowa Farm Science, August 1948, Ames, Iowa

sooner they will finish. Some lamb feeders are already self-feeding lambs successfully. But for most farmers, the faster gains aren't worth the risk of this disease.

Some farmers grind their corn and feed it mixed with ground or chopped hay. But this always leaves a question as to how much corn to use in the mixture. Also the mixing and grinding is an extra cost. That's why many lamb feeders would rather self-feed shelled corn and whole hay. Now it looks as if you can do this safely —if you feed a little sulfur along with your corn.

Last October 18 we started 6 lots of 48 lambs each on feed here at the Iowa Station. We fed them for 86 days. We paired the lots; then fed each pair alike so that actually there were a series of three tests, two lots of lambs in each.

Here's how we fed them. We fed lots 1 and 2 a mixture of ground shelled corn, ground alfalfa hay and linseed meal. We hand-fed this ration for 10 days; then self-fed, plus block salt. On the first day the mixture was 20 pounds of corn, 76 pounds of ground alfalfa hay, and 4 pounds of linseed meal. Then we gradually increased the amount of corn in the mixture until on the tenth day we were feeding 60 pounds of corn, 36 pounds of alfalfa, and 4 pounds of linseed meal. After the tenth day we self-fed this mixture.

The second series (lots 3 and 4) we fed a mixture of 95 pounds of shelled corn, 5 pounds of linseed meal, plus whole alfalfa hay and block salt. The grain and hay were hand-fed at the beginning. The grain mixture was started at a rate of .15 pound per lamb plus the hay full-fed. Grain was increased until each lamb was getting 1.5 pounds daily at the end of the first 30 days. The ration was held at this amount for 5 days, then the same mixture was self-fed.

The lambs in the last series (lots 5 and 6) were fed just like lots 3 and 4 except we mixed flour sulfur with the shelled corn and linseed meal. For the first 12 days the mixture was 93 pounds of shelled corn, 5 pounds linseed meal, and 2 pounds of flour sulfur. After that we cut the sulfur to 1.5 pounds and increased the corn to 93.5 pounds. This furnished all the sulfur needed.

There was no death loss in the two lots that were fed flour sulfur. These lambs took more time in cleaning up their grain. They didn't eat quite as much and they didn't gain quite as fast.

In the other four lots we lost a total of 12 lambs. At least two of these animals died from enterotoxemia. Four others probably died of the same trouble, but we weren't absolutely sure of the cause. The other six died from causes which, as far as we know,

AVERAGE FEED AND GAINS RECORD FOR SIX LOTS OF SELF-FED LAMBS

No Corrections Made for Death Loss

Lot No.	I	II	III	IV	V	VI
	Feeds mixed	Feeds mixed	Shelled corn	Shelled corn	Sulfur	Sulfur
Number lambs at finish	46	48	44	46	48	48
Average daily gain	.33	.29	.27	.32	.31	.32
Average daily feed consumed:						
Shelled corn 14% moisture	...	...	1.46	1.44	1.36	1.36
Gr. shelled corn, 14% moisture	1.74	1.72	...	...	...	...
Feed required 100 lbs. grain:						
Shelled corn, 14% moisture	...	...	547	446	441	421
Gr. shelled corn 14% moisture	522	599	...	...	...	...

were not connected with "overeating disease."

Mixing the hay and the corn and the linseed meal did not seem to have any advantage over feeding the shelled corn and linseed meal mixture along with alfalfa hay. Six lambs died in each group. It appears that 60 percent corn in the total feed mixture is about all these lambs could take.

The "on foot" grades for the six lots were about the same. There was little difference in gains among the four lots fed without sulfur. Lambs in lots 1 and 2 consumed about 1.75 pounds of corn daily per head. Those in lots 3 and 4 took a little less, 1.46 pounds. The lambs fed sulfur, however, consumed the least corn of all. They ate just over 1.36 pounds per head. The lambs that ate the most corn ate less hay. Average daily gains were considerably less per lamb in the two lots that were fed sulfur. But when death losses are figured in, these two lots came out better than the other four.

A Better Buffalo Grass

Condensed from Nebraska Farmer

Tom Leadley

THE most profitable ten acres of land on the Hays, Kansas, experiment station is a field of certified Hays Buffalo Grass developed there by L. E. Winger.

Its great value is in increased seed, pasture and hay production, but like other plant hybrids the growing of parent strains is pretty much a specialized business obtained by careful selection of superior type buffalo plants. Seed of the second generation would be similar to hybrid corn seed and not as valuable as that from the parent plants. The certified Buffalo grass seed is selling at Hays for 75 cents to $1 per pound. It yields on the average 500 to 700 pounds per acre under irrigation.

Buffalo grass has long been recognized as the resource upon which great plains agriculture began and prospered. It gave the rich fertile soil on which pasture and crop production flourish and is so named because the buffalo of the pioneer days lived and thrived on it. Buffalo grass of the present day is one of the best pastures of the Central Great Plains. It is a hardy, hot-weather grass of high nutritive value that resists heat and drouth.

Unfortunately too much of the native buffalo grass has been plowed up for the good of the land and for farmers. That was a contributing factor to the great dust bowl of the thirties. Once broken out the problem of getting land back to buffalo is very great. Seed production on the ordinary buffalo grass is small and difficult to harvest because the grass grows close to the ground. Spot sodding of small pieces is also used for re-establishing buffalo grass, but it is expensive and slow.

The work at the Hays Station has brought forth new methods of gathering seed and improving its germination, coupled with higher seed and grass yielding strains. This makes re-seeding more practicable.

Buffalo grass improvement at Hays by forage crop specialist Wenger, has been made by selection of superior plants from old buffalo grass pastures and plots. The ten-acre plot from which outstanding seed and hay records have been made was started six

Reprinted by permission from Nebraska Farmer, August 21, 1948

years ago by setting out cuttings in the spring in rows three feet apart each way. The settings almost grew together the first year under irrigation. By the end of the second season the sod was solid. A seed crop of 300 to 400 pounds to the acre was harvested the second year. Thereafter the seed ranged from 450 to 720 pounds to the acre. With ammonium nitrate fertilizer added, the seed production was 720 pounds in 1946. Last year seed production was 550 pounds to the acre. Aicher thinks seed production will remain high. On ordinary buffalo grass seed production runs from 25 to 75 pounds to the acre on dry land.

The seed is harvested about the end of July with a special combine perfected at the Hays Station. The principal problem of harvesting seed from the ordinary buffalo grass was due to the fact that it produces seed on short stalks that grow near the ground. It also shatters easily. The improved buffalo grass grows taller seed stalks, but still not tall enough for easy combining. The machine used at Hays has a low cutting attachment with fast sickle action. It has extra screening equipment and a wind blast attachment blows the seed onto a sliding shoe or catching device.

In addition to a seed crop, as much as 2½ tons or more per acre of good quality hay has been cut from the ten-acre plot.

Mr. Wenger discovered that buffalo grass has both male and female plants and male and female combinations in the same plant. He selected superior female plants for his row settings of sod pieces and used male plants in every ninth row for fertilization. The resulting seed crop is the same as a hybrid of any other crop. Better pasture and hay growth is obtained but the seed crop is not so good. The seed contains too many male plants, about 50 per cent, which is more than is needed for satisfactory pollination. Seed is produced only on the female plants which means that excess male plant percentages reduce seed production. Thus the highest yielding seed can be obtained only from sod plantings of selected types.

Moreover, seed must be treated to increase germination. This is done by soaking for 24 hours in a .5 per cent solution of saltpeter. Then the seed is chilled for six weeks at a 41 degree temperature after which it is dried immediately at a temperature below 120 degrees. This treatment raises the germination from approximately 10 to 70 per cent.

Spring seeding is preferred at rates varying with the price of the seed, the mixtures used and soil types. From one to three pounds of seed per acre is suggested for various mixtures and a maximum

of eight pounds per acre for plantings of pure seed. Shallow seeding is important, one-half inch is considered average. Well settled and firm seed beds are best. Undisturbed stubble is okay.

At the Hays Station seed growing height varies from less than four inches to as much as five and a half inches for the improved types.

Hay cuttings average from a little less than three tons to 3.89 tons per acre, with a top of 5.09 from the highest yielding selections in 1941.

Why Does Deep Litter Work?

Condensed from the Poultry Tribune

N. H. Randers-Pehrson

THE labor saving "deep litter" system has gained popularity with poultrymen in recent years, and so has the practice of carrying old litter over from one flock to another.

This system is, however, regarded with suspicion by some because it appears to violate the rules for strict sanitation—but it works. Reports have been overwhelmingly favorable so far. Why does it work? If we have the answer to that question, we may be better able to judge the merits of the system, and we may also find ways of improving it.

I have been using the same litter for four years now. It looks and feels like good potting soil mixed with peat moss. It is dry and absorbent, and has no bad odor. I can scoop up a handful of litter any time anywhere in the laying house without soiling my hands. I have studied this litter closely, trying to find out what goes on in it. I believe I have the answer.

The usual explanation is that the litter material being ground up into small pieces by the scratching of the hens is thereby made absorbent so it takes up moisture like a sponge and gradually releases it to be carried off by ventilation. This cannot be the main reason. If it were, we could grind the litter material to any degree of fineness in advance, dump it in all at once, and it should stay dry. That does not work. No matter how fine the stuff is when first put in, and no matter how absorbent, it first becomes messy and then,

Reprinted by permission from the Poultry Tribune, July–August 1948, Mount Morris, Ill.

unless cleaned out and replaced, it gets dry.

As I have observed the changes in the litter from week to week, it has become clear to me that what goes on is the same process as that which takes place in a compost pile. The litter gradually becomes saturated with soil bacteria, and these change the litter particles and manure into humus. This activity is interrupted every time the house is cleaned out and disinfected, and, therefore, doesn't have a chance to get started under the usual practice of strict sanitation.

A recent report from Michigan tells of "pen barns" for dairy cows, where apparently the same things happen. When the bedding is first put in, it gets soiled, and the cows may get dirty. If the barn is cleaned out and new bedding put in, it gets soiled all over again. But if new material is added on top of the soiled bedding, it will soon all become dry and firm, and the cows keep clean. This is strikingly similar to the built-up litter system for poultry.

When we make a compost pile, we always add water in quantity, and this water is not carried away by evaporation. It is used by micro-organisms in the process of converting manure and vegetable matter into humus. That, I believe, is the key to the dryness of old, built-up litter. Micro-organisms use moisture from the droppings, from the fountains and other sources in the process of breaking down the manure and litter particles.

Good bacterial activity is the main thing and this will gradually become established, but it can be hastened by putting sifted compost, rich top soil, and rotted barnyard manure in the litter when it is first built up. This inoculation is especially desirable if the floor is wood or concrete. After the litter has become saturated with bacteria, it will be self-perpetuating, unless the house is cleaned and disinfected.

The choice of litter material for the base is of minor importance, and would depend chiefly on price and availability. I use sawdust which costs me nothing. The degree of absorbency of the original material would not make any difference after the litter has ripened. Materials that break down easily are probably best; inert materials like sand least desirable.

Lime is beneficial in built-up litter, not as a drying agent, but for the same reason for which it is used in the compost pile; it helps bacterial activity.

With this system, the chore of cleaning the house has been practically eliminated. New litter material is added from time to time, and some old material taken out, but this does not have to be done at any specified time. A good time may be when the manure is

needed for the garden, or when the house is empty between flocks. Any time that suits the poultryman is satisfactory. If the material is to be stored or sold for fertilizer, it can be bagged directly from the floor. Enough should always be left to keep the composting process going.

With all the advantages of this system of litter management, there also may be a potential danger; namely, from diseases and parasites. External parasites tend to thrive in dry litter, but can be easily controlled. Internal ones prefer dampness; for example, the development of coccidia is definitely inhibited by dry litter. Whether or not the danger from bacterial or virus diseases is greater with this than any other system, we do not know. As far as I know, no outbreak of any kind has as yet been definitely traced to well-managed deep litter.

Keep Them Growing

Condensed from Hog Breeder

No PERIOD in the entire life of the pig is more critical than the 60-day period following weaning.

Thousands of silky, smooth bodied, baby pigs, frisking around their mothers' sides, looking the very picture of health, meet their Waterloo within the next 60 days of their lives and pass out of the profit making class before they are ever put into the finishing pens.

Swine growers throughout the years have wrestled with the post-weaning period and its problems with quite limited success in finding an over-all solution. While progress is being made and certain difficulties are being overcome by our research agencies, the average producer, under ordinary circumstances is still paying a heavy penalty in death losses, retarded progress and slow gains in the post-weaning period.

One of the biggest difficulties that prevails is the fact that quite often post-weaning breakdowns are not caused by any one disease but are rather the result of a combination of conditions, each of which is a contributing factor. Animals weakened and debilitated by worms are more susceptible to disease because of their lowered resistance. Pigs affected with mange or lice rub open sores on the skin and expose the animal to further infection.

An example of one of the most

Reprinted by permission from the Hog Breeder, August 1948, Chicago, Illinois

aggravating diseases affecting pigs in old lots is necrotic rhinitis or bull nose, characterized by enlargement of the nose and face and presenting an almost insurmountable problem. When a pig becomes affected and considerable swelling has occurred treatment is so difficult and so unsatisfactory as to be scarcely worth while. It requires only a few pigs like this in a herd, when production costs are as high as they now are, to knock the net profits out of the entire venture.

Experimental workers and careful farm managers have clearly demonstrated that many of the discouraging breakdowns in the post-weaning period can be avoided. To do so, however, requires that the necessary precaution be taken far in advance of the critical period. Little attention need be given the brood sow during gestation period except to provide the necessary balance in the rations and to adjust the feed during the last month before farrowing to the needs of the coming litter. As farrowing time approaches, however, some precautions become necessary. Chief among these is the matter of sanitation. Many pig farrowing plants are now of a portable nature. The swine grower has discovered so many advantages in field farrowing that thousands of producers move their pens to clean open fields rather than go to all the trouble and expense of cleaning old quarters.

But moving to new quarters, although it does give the young pigs a good break, can be counteracted almost entirely if the sows teats and udder are contaminated with hog lot filth and carry possibilities of infecting the young pigs with worm eggs, etc. Every swineman in America knows about the McLean system of sanitation; scalding and disinfecting the pens and washing the sows. While many carry out the first part of the plan, perhaps not one producer in 10 washes his sows. Any way you do it is a hard, tedious job. The result is that it is generally left undone and part of the benefit of the system is lost. There is a way which, while not perfect, does offer a considerable degree of protection. Sows running in alfalfa, or other pasture, four inches high or more, will do an excellent job of cleaning up their udders in a few days time. Don't feed them until nearly noon. They will travel around for several hours and the dew on the grass will wash them quite thoroughly, safe-guarding the area where the pigs nurse. If the weather is hot some chapping might occur but normally no difficulty ensues. It is a simple and easy way to handle a hard job; one that is very necessary in protecting your pigs. Only a small

plot of alfalfa is required if it is saved for this purpose. Cut the hay between times if necessary but don't keep hogs on it all the time.

During the nursing period pigs should be gaining rapidly and every detail should be watched to avoid retarding their progress. Keep the sows and litters on green pastures if at all possible. If this cannot be done, cut and feed green feed once or twice a day. Almost any young green plant provides the necessary elements; even green weeds can be used if no alfalfa or green cereals are available.

Give the baby pigs a chance in the creeps. They begin to eat grain when 2 weeks old, indicating that the mother's milk is not adequate for best results. See that both sow and pigs get plenty of water. Water is necessary to keep up the milk flow. A scant drink twice a day after feeding is not enough, especially in summer. Remember water is your cheapest feed.

Don't let the little pigs get on to old ground where hogs were before, especially the first three months of their lives. They will travel less, sleep more and gain faster and at less expense, if they have a self-feeder on pasture and an automatic waterer.

Generally speaking, if weather conditions permit, castration should be done early. Some do the job at 10 days of age. There is very little set back and they heal quickly. At the most four or five weeks should be the limit so that they have completely healed and recovered from the shock before weaning. Use a good fly repellent. Don't take chances on screw worm infestation.

It is better not to wean too early. Unless the breeding schedule forces you to do so, it usually is profitable to take an extra week or two before weaning. Pigs gain faster and seem to have better resistance if they are not weaned too early. Where sows were to be discarded the writer has frequently left the pigs with the sow, placing both on self-feeders, until the sows dried up naturally.

After the pigs are weaned proper feeding is important. The protein in the ration should be kept high. This is especially true if no pasture is available. It is well to remember that both animal and vegetable proteins are necessary. Up until they weigh 75 lb. this is more necessary than later on. Purdue University conducted extensive experiments at Lafayette, Ind. on mixed supplements for hogs. The results indicate that complex mixed supplements containing fish meal, meat and bone scraps, soybean oil meal, cottonseed meal and alfalfa leaf meal or linseed oil meal, not only produced faster gains but finished the hogs more evenly and uniformly than the simpler supple-

ments. These supplements of course had higher value in dry lot feeders than on alfalfa pasture.

The price of protein supplements may seem high but grain is high too. The addition of $1 worth of high priced protein supplement may save far more than $1 worth of grain in your cost of gain per pound.

Aspects of Milk Hygiene

Condensed from the Guernsey Breeders' Journal

MANY professions are vitally interested in, and concerned with, the sanitary production, processing and distribution of a safe milk for the consuming public. If the farmer is to apply successfully the sanitary procedures recommended to him, they must be economically sound.

The over-all picture of a city milk supply is complex, but an understanding of its various aspects is essential if one is to comprehend the far-reaching effects of any advice in milk hygiene given a dairyman. The milk picture for the city of Lansing, Mich., with a population of almost 100,000, will illustrate a typical set-up: 10,000 cows producing the milk on 1,000 farms with 45 haulers conveying the milk to the 10 city milk plants where it is processed, and delivered to the consumer by 120 wagons and trucks (100 retail, 20 wholesale).

The health of the cows and the methods of caring for the cows, the utensils, and the milk on the farm determine the type of milk that is produced. The need for adequate barn and milk-house facilities and dairy equipment is recognized.

Clean and Healthy Cows—The health of the dairy cow is the keystone of a safe milk supply of high quality. The fitness of cattle to produce such milk is determined by their freedom from disease. The data in Table 1 reveal the influence of udder infection on the quality of milk produced, for in each case of udder infection the percentage of cattle producing milk with a bacteria count of over 1,000 increases greatly.

The influence of cleanliness of the cow on the bacteriological quality of the milk produced is presented in Table 2. These results indicate the value either (a)

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TABLE 1

The bacteria count of milk produced by healthy and diseased cows. Samples collected aseptically from the cows

Udder infection	Bacteria per cc. of milk	
	Per Cent with fewer than 1,000	Per Cent with more than 1,000
None	95	5
Brucella	76	24
Streptococcus	30	70
Staphylococcus	25	75
Coliform	15	85

of clipping the long hair on the udder and rear quarters several times a year, by reducing the number of bacteria per cc. from 20,000 to 5,000, or (b) of disinfecting the udder and teats prior to each milking in maintaining the high quality of milk, indicated by the bacteria count of 6,800, as it is obtained from the healthy cow. Best results were obtained when both clipping and disinfecting were done, for here the bacteria count of milk produced was only 550. The necessity for having clean premises —such as lots, lanes, etc.—and the value of barns that are clean and well-bedded, are obvious in quality milk production.

Clean and Healthy Handlers—The clothes of the handlers should be clean, especially during the milking process, so as to preclude the possibility of them ever becoming a source of contamination. Since the hands have a more intimate contact with milk, a study of their influence is indicated. An

TABLE 2

The bacteriological condition of the milk produced by hand milking of apparently clean, healthy cows under varying management conditions (a chlorine solution of 300 parts per million of available chlorine used for disinfection)

Management condition		Bacteria per cc. of milk
Hair on udder and rear quarters	Disinfection of udder and teats	
Not clipped	None	20,000
Not clipped	Yes	6,800
Clipped	None	5,000
Clipped	Yes	550

opportunity presented itself to study the bacteria count of milk produced by hand milking under various conditions; the results are presented in Table 3. In all cases only clean and sanitized utensils were used to handle the milk, thus reducing to a minimum the bacterial contamination from this source.

The bacteria count of milk collected aseptically was normal for healthy cows, being 300 and 400, respectively, for the two groups of cows. The dry brushing of udders prior to milking was not enough to prevent dandruff and some other debris with bacteria from falling into the milk, as revealed by the 16,000 count of milk from the apparently clean cows and 350,000 from the obviously dirty cows. Wiping with water alone removed some of the gross dirt, but the bacteria count of milk obtained was higher, 56,000 for the clean and 425,000 for the dirty cows, than when only dry brushing preceded the hand milking process. Disinfection of the udders and teats, although not perfect, resulted in the production of milk with a very low bacteria count; 700 by the clean and 1,500 for the dirty cows. The value of clipping and disinfection is obvious from these results. A study of milkborne disease outbreaks reveals the importance of health of the dairy worker.

TABLE 3

The bacteria count of milk produced by the hand milking of healthy cows (whose udders had been clipped) that were either reasonably clean or reasonably dirty when the udders and teats were either dry, wiped with water only, or disinfected (solution of 300 p. p. m. available chlorine or one to 1,000 quaternary ammonium solution)

Appearance of rear quarters and udders of cows	Bacteria per cc. of milk produced			
	Collected aseptically from cow	After dry brushing	After wiping with water	After disinfection
Reasonably clean	300	16,000	56,000	700
Reasonably dirty	400	350,000	425,000	1,500

Clean and Sanitized Utensils—Improperly cleaned and sanitized utensils may be the sources of many bacteria, and may easily transform a high-quality milk into an inferior, or even an unacceptable product. To demonstrate the value of proper cleaning and sanitization, rinse counts were made of utensils ready for use as found on the farm. A few days later an unannounced visit was made to

TABLE 4

Number of Bacteria on Dairy Utensils

Farm	Equipment rinsed with 500 cc. of sterile water	Bacteria on equipment	
		Utensils ready for use as found on the farm	Utensils sanitized with chlorine
1	1 pail and 1 strainer	28,000,000	1,500
2	1 pail and 1 strainer	700,000	500
3	1 pail and 1 strainer	2,000	1,500

each farm. This time the utensils were sanitized with a chlorine solution (50 p. p. m.), allowed to drain for 30 minutes, and were then rinsed with sterile sodium thiosulfate water to inactivate the remaining chlorine. Bacteria counts were made of all of these rinsings to determine the number of bacteria removed by the water (Table 4). Normally, these bacteria get into the milk as the utensils are used during the milking process. These data are convincing evidence of the value of sanitization of all dairy utensils, especially those on the farm. *Clean* utensils have very few bacteria on their surfaces and, therefore, will not contribute many bacteria to the milk handled therein.

Prompt and Efficient Cooling—Milk is a good food for bacteria as well as for man and other animals. As it comes from the cow it is at a temperature ideal for multiplication of the bacteria that gain access to the milk. According to the data in Table 5, the practical procedure for dealing with these

TABLE 5

Bacteria count of milk obtained upon the storage of milk at different temperatures for varying periods of time when cooled to those temperatures immediately after production

Period of Storage	Bacteria count of the milk							
	Original count 5,000				Original count 100,000			
	Temperature of immediate cooling and storage of milk							
	40 F.	50 F.	60 F.	70 F.	40 F.	50 F.	60 F.	70 F.
5 hours	5,000	5,000	5,000	7,500	100,000	100,000	100,000	340,000
10 hours	5,000	5,000	6,000	28,000	100,000	100,000	180,000	870,000
15 hours	5,000	5,000	12,000	200,000	100,000	150,000	300,000	2,000,000

bacteria is to cool the milk immediately to 50 degrees fahrenheit, or lower, and to hold it at that point until it goes to the receiving station.

An Adequate Water Supply That Is Both Satisfactory and Safe—Dairy animals need a constant supply of clean and fresh drinking water if they are to produce at a maximum. A similar water supply is essential for the proper cleaning of dairy utensils, and for the cooling and storage of milk. Occasionally the water supply, used for these purposes, becomes contaminated with specific types of bacteria that produce undesirable changes in the milk besides being objectionable merely because of their presence. The ropy milk bacteria come under this category.

A review of two experiences will direct our attention to some of the aspects of overcoming the ropy milk problem. An outbreak of ropy milk presents the following two characteristics: (1) The milk is normal in physical appearance, as it is obtained from the cows, and (2) A tenacity of the contaminated milk, and especially the cream, develops within 12 hours if the milk is not properly cooled. Several organisms, including some of the coliform group, are capable of causing ropy milk, but the main one is *Alcaligenes viscosum*. The original source is not always known, but stagnant water in the barnyard or pasture should be immediately suspected, while the immediate source is usually the coat of the cow or surface water that gains entrance to the well water.

In one case studied, the milk apparently became contaminated, during milking, from the exterior of the cow. The cows were immediately prevented from gaining access to stagnant water in the pasture where they had gone to keep cool during the summer heat, but the ropy milk trouble continued. A thorough checkup revealed that the farmer always rinsed the stirring rod in the cooling tank between cans and between milkings. Thus, the cooling tank water was inoculated from the contaminated milk on the stirrer. As a result of this insanitary practice, the cooling tank water became heavily inoculated and, through the stirring rod, became the immediate source of subsequent contamination of the daily milk. A thorough cleansing and disinfection of the cooling tank and discontinuance of the practice of rinsing the stirring rod in the cooling water overcame the difficulty on this farm.

The second case was very similar insofar as the original source and its elimination were concerned. It was dissimilar in that the farmer did not rinse the stirrer in the cooling tank water, yet ropi-

ness appeared rather consistently by morning in his night's milk. The contaminated area was in the poorly drained barnyard. On this farm the milkhouse was situated directly over the well which was the source of water used for washing and rinsing equipment and for the cooling of the milk. The concrete cover of the well, which was also the floor of the milkhouse, had a crack in it so that water from the milkhouse could seep back into the well. Apparently the milkhouse floor became inoculated with ropy bacteria from the farmer's shoes. This inoculum had an opportunity to build up in the well by the daily addition of contaminated water from the floor. Since no chemical sanitizer was used as a final treatment of dairy utensils on this farm, and since the dairy detergent did not inactivate the ropy milk organisms, the utensils were always contaminated, and served to inoculate the milk. To overcome the chain of contamination, a new well cover was installed. The working surfaces of the milkhouse and cooling tank were thoroughly cleaned and then disinfected with a chlorine solution. A strong chlorine solution was prepared (one pound of chlorine powder, containing 15 per cent available chlorine, was dissolved in five gallons of water) and placed into the well. After one hour the pump was run for 15 minutes to draw this water through the pump and pipes. Apparently this served to destroy the ropy milk bacteria because none could be recovered from the water after this treatment, and no more ropy milk troubles were experienced.

What is New in Equipment?

Condensed from Everybodys Poultry Magazine

Carl O. Dossin

Labor efficiency on poultry farms has increased tremendously in recent years. The need of producing more eggs and meat with less labor has encouraged the commercial poultryman to work out new methods, such as enlarging his pens, rearranging his equipment, and using more mechanical aids. By careful planning, it has been possible to increase the number of birds that one man can tend and also make it possible to do a better job.

Fifteen to 20 year ago, pens 20 feet square were common. Farmers carried feed into the pens in buckets, running water in poultry houses was almost unheard of, and artificial lighting was still largely on an experimental basis. Today, poultrymen expanding their business are thinking in terms of laying houses 40 to 60 feet deep. One building completed in Pennsylvania last year is 60 feet deep and 350 feet long. Layers are kept on three floors with feed running by gravity into carriers on each floor. A water trough extends from one end of the building to the other. Lights go on and off automatically. There are no partitions in the building. In the single pen on each floor are 7500 White Leghorns—over 20,000 layers in the one building! No one knows how large the poultry pen of the future will be nor how many birds one man will be able to care for.

Poultrymen not interested in building new houses are increasing the size of their present pens by removing partitions in old buildings. Some are going at it cautiously by removing every other partition, thus doubling the size of their pens. Others have removed all partitions, making one large pen. Thermostatically-controlled exhaust fans are used in many of the large pens to aid in ventilation.

By removing partitions, not only is labor efficiency improved, but the number of birds a building can accommodate is increased. Less floor space per bird is required in large pens than in small pens.

Poultrymen are studying all their equipment with an eye to efficiency and utility. For example,

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even the old style individual compartment nest is being looked at with a critical eye. Producers want nests in which there will be a minimum of egg breakage, from which the layers cannot scratch too much nesting material, from which it is easy to gather eggs, and which will be easy to clean and keep free from mites. The community type of nest is gaining in popularity among some poultrymen, particularly those with heavy breeds.

Gathering, cleaning, grading, and packing eggs requires more time than any other daily chore on the poultry farm. It is easy to understand why the poultryman is devoting considerable time and effort to ease the egg work wherever possible. Equipment manufacturers are meeting this challenge. Machines which clean eggs while dry and others which wash eggs have recently been developed and are now used extensively by commercial poultrymen.

Mechanical egg graders now enable the poultryman to make a more uniform pack of eggs. They eliminate a lot of the guess work that is involved in the grading of eggs by sight.

In recent years, poultrymen have become egg quality conscious. Perhaps a dozen commercial poultrymen in Pennsylvania have installed artificial cooling and humidifying units in their egg rooms. This equipment has enabled them to have their egg rooms on ground level and has eliminated the necessity of carrying eggs down stairs to the egg room and then up again when loading for market.

Carrying water on commercial poultry farms in the Northeast has been almost entirely eliminated by piping water to the laying pens, brooder houses, and range and the use of automatic fountains. It didn't take the poultryman long to figure out that 100 layers require four to five gallons of water a day, 1400 to 1800 gallons of water a year.

In areas where there is danger of the water lines freezing in winter, many poultry are fastening electric heating cable, another new product, along the water lines. Frozen pipes may cause a lot of inconvenience and extra work.

Careful planning has eliminated much of the heavy work in handling feed. Elevators or lifts have been installed in many multiple story buildings to raise the feed to the upper floors. Frequently the feed is then distributed from bins to the lower floors by means of chutes. In other instances the feed is delivered by means of a carrier to the various pens.

A mechanical feeder is being experimented with on the poultry farm of the Pennsylvania State College. The hopper to this feeder can be located in the feed room

and the feeder extend through the pens. A time switch operates the feeder at regular intervals. In this way fresh feed is added and the other feed stirred.

Practices followed in brooding today were thought impossible a few years ago. Little did anyone dream that one man would be able to brood as many chicks as he is now doing. Instead of using colony brooder houses, as in the past, the trend is toward permanent brooder houses. Some of these houses have hot water heating systems with pipes in the floor, others have pipes above the floor with hovers over them, while others have pipes along the wall. In a brooder house with radiant heat in Pennsylvania, one man broods 38,000 chicks.

Improved poultry rations now make it possible for poultrymen to raise pullets to maturity in complete confinement. Poultrymen who are raising their pullets in this manner feel that the system has helped to solve a labor problem. It eliminates the necessity of shutting shelters in the evening and opening them again in the morning when there is a problem with predatory aninmals.

Poultry farming is big business. Tremendous progress has been made in recent years. It can continue to expand and develop. Careful planning, efficient production, and wise investment of capital in plant and equipment will keep the enterprise on a sound footing.

Soil and Proteins

Condensed from The Land

Dr. William A. Albrecht
Chairman, Department of Soils, University of Missouri

RAINDROPS of the same size and shape are falling today with the same impacts and foot-pounds of energy for work in breaking down soil granules as they always have. But the chemical composition and other properties within the soil are significantly altered. A major but unappreciated change has been the decrease in the stability of the soil granules or in the stability of the soil structure. Soils that once retained well their loamy condition and plow-turned forms all through the winter, and through many rains after tillage, are now soon beaten down by only a few of them. As a result, much of the subsequent rainwater runs off and does not enter into the soil. We do less fall plowing. Our soils must be spring plowed if they are to remain granular and well aerated as a good seedbed through a significant part of the crop season.

This decreasing stability of the soil's granular structure is only another way of saying that the incidence of a weakened, if not a "sick", soil body should be taken as the major change in our soil and thereby the basic cause of the increase in erosion. Here is the big reason why water has not been going into our soil, but running off. It has been increasingly destroying the means by which food is created and agriculture is maintained.

Acid soils, soils that are highly saturated with hydrogen which is not a plant nutrient and therefore desaturated of calcium, magnesium, and all the other nutrients, do not granulate readily. Nor do they grow the nitrogenous crops to give calcium-rich, nitrogenous humus in the soil that brings about the stable granulation. Soils deficient in fertility are of weakened soil body. They are subject to severe erosion because that fertility deficiency is the weakness or the sickness. When surface soils lose their fertility to become similar to subsoils in this respect, they, of necessity, erode as badly and as rapidly as subsoils.

Soils deficient in fertility fail to grow cover quickly, or cover dense enough to be a mechanical aid against runoff and erosion. Barren soils erode because they are not

Reprinted from The Land, Summer 1948, Columbus, Ohio

fertile enough to feed the crop we grow on them and to have extra fertility kept in the cycle of going into organic combination as weeds and out again through their decay. In other words, our soils cannot take the impact of the rainfall because their fertility has declined too far to permit a stable soil structure to grow cover quickly enough for prevention of excessive runoff and erosion, and to add organic matter.

To emphasize the decline of fertility in our soils may seem to be a mistake with our memory still strong (a) of the 1947 wheat crop in Kansas, the largest in our history, and (b) of the increasing yields of corn as the result of the scientists' application of hybrid vigor to this feed grain of high fattening power. Nevertheless, it is a fact that while the bushels per acre of both wheat and corn have been going upward, the concentration of the protein within each of these grains has been going downward. Because of the recent persistent decline in the concentration of protein in the wheat, the War Food Administration lowered the percentage figure which had long been the protein standard required of this food grain. Even though the total wheat crop has been increasing as bulk, the "hard" or high-protein wheat has been marching westward in the United States. The "soft" or low-protein, and therefore high-starch, wheat has been following in its wake. In like manner, the corn which had a protein concentration ten years ago of nearly 9.5 per cent, has the average figure of 8.5 per cent today.

While our crops have been yielding bushels per acre bountifully, those bushels have consisted mainly of the photosynthetic product, starch. At the same time those crops have been synthesizing for us less and less of their biosynthetic food products, particularly proteins. The soil that has been eroding more and more because of its declining fertility is the same soil which, for the same reason, has been giving us less and less protein, the food constituent so basic to reproduction and growth of all forms of life. Implied, then, in our conservation of the soil, is our struggle for food protein in order that we may survive.

"Yes," you may say, " we shall grant that the high yields in terms of both bulk and quality of our grain crops and the better reproductive capacities of their seeds may demand fertile soils. But there is still extensive room for a grass agriculture with less soil tillage in place of so much grain agriculture with its intensive stirring of the soil." However, one needs to be reminded that grasses are natural in that part of the ecological pattern where moderate rainfalls in the temperate zones have not weathered the rocks into the

highly leached or nutrient deficient soils. They are growing on fertility laden soils.

Grasses are therefore feeds that are mineral-rich, and protein-rich. They are "grow" feeds rather than only fattening feeds for the herbivorous animals. They are therefore not to be juggled about from location to location merely as mechanical soil cover against erosion. They were native to soils of low rainfall or where cover was not the major part of their service in the great pattern. They were growing on soils granulated so deeply and so well as to take water readily to great depths. If the grasses are moved merely to give cover services in regions of high rainfalls, of leached soils, and of once-forested but now cleared areas, they cannot be protein producers for buffalo or beef cattle as we think of these in their prairie habitat. They may be soil cover, but are they capable of more than the photosynthetic performance of making wood by which their vegetative predecessors, the forests are characterized?

Grasses may well be considered as soil cover in our efforts for soil conservation, but when so used in soils naturally leached or exhausted of fertility by cropping, we must ask whether they can be feed for the animals by which this form of verdure must become an aid for human survival.

It was the virgin grasses that indicated the high level of fertility in the prairie soils. It was the reserve of both organic and inorganic fertility there which served to grow the crops and livestock in the mid-continent and gave us our American prosperity. While we have been prone to speak of the prairie soils and their grasses in the ecological pattern as though the grass controlled the soil and its high fertility, we have failed to appreciate the great fact that the fertility of the so-called "prairie" soils conforms to the climatic pattern of the development of the soil.

Our prairies represent the maximum of soil construction from the rocks by the climatic forces of rainfall and temperature, and also the minimum of destruction in terms of the capacity of those soils for growing protein-rich and mineral-rich foods and feeds for man and other higher animals. It was the prairie soils which, in their virgin conditions, were producing the bison, the large, well muscled, heavily boned, and herbivorous animals in large numbers. Those same soils today are producing domestic animals not so widely different from the bison in feed requirements, particularly beef cattle. These cattle are more highly concentrated in those soil areas than they are farther west, or farther east, where the hogs and their fat-producing power predominate. It is the cattle that are

appreciated as providers of protein for the provision of which the nitrogenous and mineral-containing feeds are required, and widely grown there. They are not so deficient there as to necessitate importing them as supplements, as is the case on the more highly weathered soils in the East and its exhausted soils, or to the West with its undeveloped and rocky ones.

With the increasing rainfall in going across the United States from West to East, the maximum of protein production does not rest on the soils highly developed under high rainfall with maximum production of vegetative bulk. This food producing capacity rests on soils with a moderate degree of development under moderate amounts of rainfall in the temperate zone. These soils give production of less bulk as found in our mid-continental belt. In the less developed, highly calcareous soils to the west of this area and in the more highly developed, hydrogen-saturated soils to the east of it, the fertility fails to support our crops as effectively in synthesizing those combinations of the amino acids representing the complete proteins required for maximum of human and animal health. It is in this limited, mid-continental belt where the soil fertility combinations permit plants to carry on both photosynthetic and biosynthetic activities to produce both carbohydrates and proteins. This is in decided contrast to the more highly developed soils of the East and South where carbohydrates are the main agricultural output.

It is the fertility pattern of the soil according to the climatic pattern that determines whether we have largely calories in carbohydrates or whether we have also proteins, minerals, vitamins and all the other essentials of good nutrition for man and his animals. That same fertility pattern gives us the corresponding ecological pattern, or the distribution of all life. It carries deepseated and powerful implications in the solution of our problems of soil conservation. In attempting to conserve the surface layer of the earth's crust one dare not disregard or run afoul of the climatic forces in control of the development of the soil. They are in control of the assembly lines of agricultural production and all creation originating in the soil minerals and soil organic matter. Either they supply us or they deny us the nutrients serving as the foundation of the entire biotic pyramid with man at the top.

Soil conservation is not the application, on a national scale, of any single practice. It is the use of many practices according to the conditions of the soils. In the humid regions, for example, where shallow surface soils are underlain

by infertile subsoils, erosion is cutting away the very basis of agriculture. It is inviting drought damage. But such damage is disaster, not because the plants are failing to find water, but rather because the roots are going into the subsoil to escape the desiccation of the shallow surface soil. They are making a transition from the source of both water and fertility to a source of water only.

Drought damage to Missouri corn in the summer of 1947 represented a shortage of fertility because of dried, shallow surface soils overlying infertile clay subsoils and not because of a shortage of water for this crop. These facts were demonstrated by the absence of drought damage on the experimental plots given enough extra surface soil to double the normal depth of the soil. There was likewise no drought damage to the corn crop where liberal fertilizers were put down into the subsoil a few inches below the surface soil by means of the subsoiler on a TNT plow.

Soil conservation in the humid area calls for attention to fertility and for building the shallow soils deeper in these nutritional respects. It demands improvements in both the physical and fertility conditions of the subsoil as well as topographic rearrangements. Conservation calls not only for prevention of erosion, but also for efforts in building up the soil in its fertility supply by building downward. Such soils call for conservation practices quite different than do the deeper soils of the semi-arid area in Western Kansas, for example, where once was the dust bowl and where last year those remnant soils produced the maximum wheat yields in the history of that state.

Soil conservation implies a need for reduction in the economic pressure on the soil. Reports by the Federal Land Bank on the management of farms obtained through foreclosures tell us that only those farms with the more fertile soils could be managed by the Bank without loss. As the soils were less fertile, the farms failed by larger amounts to be safe investments. If poor lands cannot pay for maintenance of their fertility, as is shown by these data, it is evident that the better lands are listed in a favorable economic classification because they have enough fertility to be mined to keep them under that category. Future generations are therefore already in jeopardy not only as concerns the economics of agriculture, but also as concerns food production for survival. Economic pressure, which the farmer can pass on to no one else but which must be passed by him to the soil, has brought our agricultural economics to the point where we

are liquidating the capital assets (which is our natural food resource) and calling it profit.

One needs only to look at the soil map of the world to see the rather limited areas where the fertility is sufficient to produce hard wheat or to grow protein. These areas are in central United States, in Soviet Russia and in most of the British possessions. There are none mapped as such in Germany and Italy. When foods of more than mere caloric values are required to win a war, there are suggestions that it was reasons residing in the soils of the different countries that classified them as the victors or the vanquished. It is no great stretch of the imagination to see who the present great powers are in terms of soils that produce protein-rich foods. Can it be beyond the elastic limit of the imagination to see the world problem as mainly a food problem when once the soil fertility pattern is understood and when we remember that more than only calories and bulk are required of the foods that really dispel hunger? If we are to carry the major part in providing proteins for war-torn peoples whose older soils have dwindled in their capacity to grow such quality foods or even to provide oils and fats, shall we not approach that responsibility cautiously and raise the question whether we do not need conservation of our own soils in a degree never yet contemplated?

Parathion Controls Greenhouse Pests

Condensed from Farm Research

W. E. Blauvelt and J. R. Hoffman

"IT'S THE answer to the rose growers' prayer" said Harold Koenig, manager of the United States Cut Flower Company rose range at Elmira, New York and president of the New York State Flower Growers Incorporated. "It's giving just about perfect control of red spider and with one-fourth the number of treatments needed with HETP and gets all the other pests at the same time. We want to use it for the entire range as soon as we can get it."

"I've never seen anything like it" said Harry Allyn of Big Flats, New York, famous the country over as a grower of super-quality pompom chrysanthemums. "Just those two applications to the stock plants have cleaned up red spider mite, aphids, thrips, and everything else in the line of insects. All our cuttings and young plants are coming clean as a whistle."

"We haven't had to use any other insecticide on any of the crops since you started the treatments with parathion about ten months ago" said Fred Horton, manager of the Department of Floriculture range of experimental greenhouses at Ithaca. "It's even cleaned up mealy bug."

These remarks are typical of the response of professional flower growers to the performance of the new insectide parathion as demonstrated in an extensive program of experiments carried on by the writers over the past 13 months. Owners and managers of 12 commercial greenhouse ranges have cooperated in the tests covering nearly the entire range of greenhouse florist crops and pests. Over 250 parathion aerosol treatments have been made to greenhouses totaling over 30,000,000 cubic feet of greenhouse space and nearly 60 acres in area.

Most of the experimental work with parathion for greenhouse pest control was devoted to its use in aerosol form, because of the great advantages of this method over conventional spraying in speed, convenience and saving in labor costs. A treatment requiring hours of hard work by spraying is accomplished in a few minutes easy stroll through the greenhouse with the aerosol bomb.

An aerosol formula composed of 10 per cent by weight of tech-

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nical grade parathion and 90 per cent of liquid methyl chloride gas was used in most of the experiments at the rate of 1 pound to 50,000 cubic feet.

Parathion has been found to exert a powerful fumigation action under greenhouse conditions as well as being highly effective as a contact and stomach poison. It remains effective for a week or more after application.

Parathion has proved to be the best material so far tested for control of the two-spotted spider mite, or "red spider". Single applications of parathion aerosols have consistently eliminated 95 to over 99 per cent of the entire population. In extensive long-term trials on roses in commercial ranges the parathion aerosol has given complete control of the pest with applications at 1 to 2-month intervals.

Against the common citrus mealybug, hardest of all greenhouse pests to kill, parathion was again outstanding. Two aerosol treatments about two weeks apart completely eliminated the pest on begonias and destroyed over 99 per cent of an extremely heavy infestation on gardenias.

Parathion aerosol has been found highly effective against various species of aphids and thrips, the Mexican mealybug and other species, greenhouse whitefly, cyclamen mite and broad mite, leaftyer, rose leaf roller, tussock moth, cockroaches, sowbugs and pillbugs, Japanese beetle, ants, and all other greenhouse pests against which it has been tested, with the exception of slugs.

Parathion has also proved outstanding in plant safety. Representative types and varieties of roses, carnations, chrysanthemums, snapdragons, gardenias, orchids, begonias, azaleas, cinerarias, and hydrangeas, as well as nearly all of the other plants grown commonly by florists, have been treated numbers of times with parathion aerosol without injury. In addition the treatment has been used safely on literally hundreds of species of less common specialty crops and conservatory plants.

The experiments of toxicologists with laboratory animals indicate that parathion is highly poisonous and must be handled with due care. However, the extensive experience of the writers with parathion aerosol treatment of greenhouses leads them to feel that the material can be used with entire safety in this way if proper precautions are followed.

The operator applying the material can be completely protected by the use of approved types of gas masks, and protective clothing as already used extensively by florists in the application of HETP and TEPP aerosols.

Neither the writers nor any of the workers in twelve ranges in

which the experiments have been conducted have experienced any ill effects or any of the preliminary symptoms from either making applications or in working with the treated plants and handling the cut flowers containing parathion residues.

Chicken-of-Tomorrow Facts

Condensed from American Poultry Journal

Ralston R. Hannas

THE Chicken-of-Tomorrow Contest that ended on June 24 at Georgetown, Del., is now history. The winners and high scoring entrants have been acclaimed in this three-year contest that has attracted so much attention from both producers and consumers.

This contest, sponsored by the A & P Food Stores, was the culmination of contests that started in 1946 when dressed poultry shows were held in 31 states. Again, in 1947, 38 state Chicken-of-Tomorrow contests were held, besides 5 regional contests made up of winners of the state contests.

For the 1948 contest, 40 contestants and 7 alternates were selected, with priority given winners in 1946 and 1947 contests and the regional contests. For one reason or another, 4 of the contestants were unable to compete, so they were replaced by alternates.

Each contestant and alternate shipped 2 cases of eggs to the Bradley Hatchery, Easton, Md., on or before March 1, 1948, where they were hatched. After a hardening period of 4 to 6 hours, they were graded rigidly, wing-banded, and only the alert, upstanding chicks placed in the brooder house. Each lot of chicks was placed under a coal burning brooder stove in a 15 by 20 ft. pen, allowing ¾ sq. ft. of floor space per chick started. There were 20 of these pens in each of two long parallel brooder houses that were 200 ft. apart. The feed formula used was designed by the American Feed Manufacturers Ass'n.

Mortality through 12 weeks of age was 6.21%—the lowest for an individual pen being 1.25% and the highest 15.5%. There were 4 diseases of major importance that affected the chicks, namely, epidemic tremor, bronchitis, cecal

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coccidiosis and Newcastle disease. The Newcastle attack was not a serious one but it did affect weight gains. The management feels that gains would have been better throughout if the disease had not struck.

At the close of the 12-week growing period, the birds were weighed, and this live weight constituted the figure used in calculating pounds of feed per pound of gain. They were taken to the processing plant, placed in batteries and fed and watered from Thursday afternoon until Monday morning; weights were taken following the end of the feeding period before the birds were hung on the shackles for dressing. Each lot was dressed separately, and final weights of the dressed lot taken.

The 40 contesting pens were divided by breeds as follows: White Rocks, 12; New Hampshires, 12; Barred Rocks, 3; Cornish x New Hampshires, 2; White Cornish x New Hampshires, 1; Cornish x White Rocks, 1; White Cornish x White Rocks, 1; White Cornish x White Giants x White Rocks, 1; White Wyandottes x White Rocks, 1; Indian River Cross, 1; Barred Rock x New Hampshires, 1; White Americans, 1; Eisenbars, 1; Dark Cornish, 1.

Only a little over 8 points separated the winning pen from second place winner, although from here on down, it was just a matter of a fraction of a point in many instances that separated one pen from another. Between 8th and 1st place pens, there was a difference of only 17.88 points.

A definite score card had been established as a basis for judging and each entry was judged on the conformation of the birds after dressing and on the economy of production.

Some pens excelled in egg production of the parent flock, others excelled in hatchability and mortality, while others scored very high in feed consumption and live weight. One pen topped the others in rapid and uniform feathering, while another pen showed the best uniformity of size; 4 pens made identical scores in the uniformity of type and color in live birds.

Conformation of dressed birds, including factors affecting edible meat yield, total 80 points for a perfect score. The winning entry led the field in the factors dealing with the body being well-proportioned; the breast broad, long, full meated and well rounded; and the keel bone well covered and parallel with the back.

Although this contest is over, this is by no means the end of the Chicken-of-Tomorrow idea. It will be continued; many states have already gone ahead on their own initiative and have held contests this past year and will con-

tinue to hold them. The interest in meat type chickens is keen, and the impetus given by the Chicken-of-Tomorrow Contest will continue.

America's New Acres

Henry J. Beckman

ONE of the outstanding results of the widespread dissemination of knowledge concerning new practices in agriculture is that it has stimulated farmers to adventurous thinking on their own. This in turn has led to some adventurous practices in farming that are radical departures from the conservative patterns of the past.

Not all of these present day practices in agriculture are in accord with the best advice of the agricultural extension service and other agricultural advisory agencies. The long term effect of some of these departures may bring this fact into clear relief in a very regrettable way.

If history repeats itself, climatically, the time may come when the nation will have cause to regret the plowing up of 1,300,000 acres of grassland for the 1947 wheat crop. Since 1946, according to the Bureau of Agricultural Economics, in the Plains Country, farmers have plowed up and planted in wheat close to 3 million acres of grassland. Along with this the amount of land that has been summer fallowed has declined. If dry years and dust storms should return, this adventurous procedure might have disastrous results.

We are now in our eighth successive year of high level farm production. With the outlook for continued foreign need and a hungry world, the need for America's farm products will doubtless be strong enough to justify full capacity production again this year. Barring any unforeseen financial catastrophe farm prices will probably remain at reasonably high levels during the year. With increased supplies of farm machinery production will doubtless be high for the ensuing year.

In every era of high prices the demand for new land has been stimulated. The current situation is no exception.

Along with the development of

new lands has been an increase in the size of farms. Within a quarter of a century the size of the average farm in the United States has increased from 148 to 195 acres. At the same time the percentage of the total U. S. population that now lives on farms has materially declined. The impact of two wars and the attraction of high wages in war industries in cities has no doubt been a large factor in this migration from the country to the city.

With the draining off of farm help during these years has come an increased use of farm machinery so that production per man has greatly increased. This additional heavy machinery has made possible the development of considerable new land in connection with farms that are already in production.

Contour farming has enabled land owners to develop and put into production some areas where erosion would otherwise have made such farming impractical. Heavy machinery has also greatly facilitated the drainage of swampy areas and the clearing of timber and brush areas so that in the year 1945–46 approximately a million acres of new land was added to America's farming area in spite of some abandonment to pasture.

The history of American agriculture has been one of soil exploitation and moving on to virgin lands. Such procedure is now precluded by the very limitation of available farm lands. In the future new lands will require development and such development will continue to be increasingly costly unless some new methods in scientific and engineering procedure becomes available. It would be utterly foolish to say that we have reached any finalities along this line. To try to forecast such achievements would likewise be folly. With engineering skill and inventive genius some tremendous possibilities present themselves.

We know that thousands of acres of the lower Mississippi Valley have a burdensome surplus of water. Excess rainfall and flash floods often prevail in areas far to the north, in regions having sufficient altitude to permit water to be transported, at least partly by gravity, to other parts of the United States where sparse rainfall is the one factor that prevents abundant production. Where gravity cannot be used as a means of water transportation electric power may some day be used to raise the water with booster pumps to the great plains area, just as it is now done in many areas of the far west.

The proposed harnessing of

the great river system of the mid west will some day be realized. Its effect upon the economic security of agriculture in that area will be most significant. The great tide of agricultural immigration that has always moved toward the west may then find an abundance of new production possibilities on its own doorstep.

Granted that millions of acres of land in the region east of the Rockies are too rolling to be irrigated by gravity irrigation methods, such difficulty is now being overcome on thousands of far western farms by the use of overhead irrigation systems. Perhaps for the immediate future sufficient level land, suitable for supplementary irrigation by gravity, will be available in the midwest to utilize all the water that can be conserved under economically feasible methods.

All such projects will be costly. They involve wide areas of country and long distances of transportation of water and must necessarily be undertaken under some plan of federal supervision. They embrace a wide scope of human rights and social relationships. They require many years time and many millions of dollars in expenditures. They are predicated upon a long range future and will have a definite effect both socially and economically upon the destiny of the areas in which they are located. They challenge man's initiative and call for the greatest engineering skill. The immediate present, so far as America is concerned, does not press the issue. The world's hungry millions and our own destiny will some day bring the problem of additional new acres for America into clear relief.

The Youth Hostelers

Condensed from the New England Homestead

Betty Jean Lee

MR. ALBERT J. ORR of Littleton, N. H., is a typical New England farmer. But he does more than raise vegetables and animals.

Every year a new crop of young people turns up at his place. Some stay overnight and some stay longer. They arrive by bicycle or on foot—once in awhile on a

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horse. They cook their meals in a three-sided "cook shed" on the hill across from his home. They sleep on straw-filled bunks, play ping pong in the game room, sing around a fire or play games on the lawn. Some stay long enough to help him plant his corn or dig potatoes, or bring in the hay.

Most of the young visitors are city dwellers, unaccustomed to farm life but eager to find out how the farmer lives, and to help with chores whenever they can. They come from all over New England, all over the United States—there are even some from Britain, France and other European nations. The visitors at Mr. Orr's farm are youth hostelers and they are there because he operates one of the 200 hostels in the United States, about a third of which are in New England—in Massachusetts, (the headquarters is at Northfield), New Hampshire, Vermont, Rhode Island, and Connecticut.

Although Mr. Orr's wife died soon after the hostel was opened nine years ago, he has continued to operate it to "keep himself young." He says he hasn't had trouble with a single hosteler even though he sometimes registers as many as a thousand in a summer.

Most hostels are on farms and are operated by youth-loving houseparents who have turned over part of their homes or farm buildings to be used as eating and sleeping quarters for the hostelers. Houseparents seldom make a financial profit from their hostel but they gain immeasurably from the friendships they form, the types of people they meet, the lessons they learn from the students, teachers, stenographers, factory workers, and others who visit them.

All hostelers travel under their own power, do their own "housekeeping" at the hostel and help the houseparents in any way they can. For their lodging they pay 40 cents a night if they are under 21 (50 cents for adults) and this fee is kept by the houseparents to pay expenses and help keep up the hostel. Local committees are formed to sponsor each hostel and to help raise funds for improvements. Hostelers also help by organizing work parties or by staying over a few days to help build on a room, install some plumbing or paint the furniture.

At Sunderland, Mass., where the birthplace of Monroe Smith, founder and director of American Youth Hostels, is now used as a hostel, a young man on a hostel trip stopped for a few days and stayed for months—painting the hostel and other buildings, doing construction work and helping the housemother, Mrs. Arthur Proctor, in any way that he could.

The Youth Hostel at Amherst, Mass., was built by hostelers and

Amherst citizens who contributed their money as well as their labor to the project. And each year at apple-picking time those who stop at the Amherst hostel become apple pickers over night. For the houseparents, Mr. and Mrs. Herbert Hutchings, have a large apple orchard and hostelers are always glad to help. One New York City girl, a magazine writer, wasn't sure she would like hosteling. But on her first trip she stopped at Amherst and after a day in the apple orchard she was certain it was the life for her. A British hosteler, Bill Adcock, spent a whole season helping the Hutchings, and they could cite many more examples of how their hostel helped them to recruit farm hands.

Because hosteling is primarily to encourage young people to travel—under their own power—hostelers are asked not to stay longer than three nights at each hostel. But this rule is waived when there is work to be done and if the houseparents wish they may let helping hostelers stay a week or a year. One hosteler spent four months, and another three months at the Bear Clan Hostel in Levanna, New York. Both were helping the houseparents with the farm work.

New York City hostelers recently organized a work party to get a hostel at Martha's Vineyard ready for opening, and another to build an outdoor fireplace, paint furniture, make curtains and otherwise improve the Camp Hazen Youth Hostel at Chester, Conn. At Kansasville, Wisc., hostelers helped Housefather Austin Lewis with the haying, and at other hostels all over the United States hostelers have helped out when asked—and often without being asked.

If you are interested in establishing a hostel in your community or on your farm you probably will find hostelers and other citizens willing to help. Farm organizations have also cooperated in the development of the hosteling program. One recent example of this has been the Grange in West Tisbury, Martha's Vineyard, which has taken the sponsorship of a hostel there. This hostel, in 1947, accommodated over 2,000 individual hostelers during the season.

There were more than 20,000 hostelers in the United States in 1947 and more persons are getting AYH passes every month. More hostels and hostel trails are needed for them. If interested write to American Youth Hostels, Northfield, Mass., for full information.

Blueprint For Beginners

Condensed from the Shorthorn World

Dr. Carl W. Gay
Ohio State University

GROWTH and development in any business is marked by the number of new accounts and once a new account is entered upon the books the next concern is the number of these accounts on which repeat orders will be received. No business is a going concern until repeat orders begin to come in and no business can survive without them. But repeat orders, unless they be of increasing volume, merely maintain the status quo. Only after orders from new customers, from whom repetitions may be expected, ultimately, are received, can real gains be reported.

It is like the difference between just maintaining the fertility of the soil and actually building it up. Putting back all the fertility, in the manure, that has been taken off by the crops fed, no crops having been sold off the farm, will hold the fertility but that is all. If, in addition, the manure contains the fertilizing constituents of purchased protein concentrates and alfalfa, this added fertility accumulates, season by season, and adds up to a substantial increase over the original state of fertility of the soil.

And so, it is in the cattle business. Old established breeders trading around among themselves may hold breed prosperity together but new breeders furnish positive evidence of a definite growth of breed interests. Old breeders may broaden the scope of their operations with a larger herd and a more extensive show program but not until new money and new personalities come into the picture is real material development shown.

Some people are apprehensive of competition and look with disfavor on the expansion of breed boundaries as bringing in competitors for a share of the business. True it does but the astute business man reasons that where business is good there is sure to be competition and where there is little competition there is likely to be little business. He comes to look upon competition as a symbol of good business and regards it with confidence rather than with apprehension.

Such should be the attitude of the established breeder toward the

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novice. This thing works in a circle, new buyers create a broader demand for good cattle, and sales to meet this demand may be shared by all breeders, even the new ones who have helped to create the demand by the establishment of their own herds.

Auction sales are great equalizers. Certain families of cattle, as well as certain farms and breeding establishments, may be played up in the sales talk for certain offerings, to an apparent undue advantage but this appeals only to the uninformed. The experienced buyer is not misled by such propaganda. He knows true values and recognizes them without any guidance from the auction block. In this way the little fellow, so-called, is enabled to meet the competition of the big outfit. The latter may be more aggresive and excel in going after the business but the consignment of the lesser known breeder, if it has the class has a fair and nearly even chance in the competitive bidding. If he has the breeding and the cattle it is inevitable that he will gain ultimately the recognition of the intelligent buyer and find a good market for his own cattle, in spite of the competition of the more pretentious breeder.

It is certain that not all of the newcomers will stay. The ranks of the new recruits are continually undergoing depletion for a wide range of reasons. Some new breeders are successful business men who are accustomed to quick returns on their investments and being unable to realize these from their investment in cattle they lose interest and sell out. Others have entered their new field with exalted ideas of their potential achievements and when these do not pan out as preconceived the new enterprise is promptly forsaken. There are those whose enlistment in the cause stems from an appeal registered while watching the cattle being judged in the showring. The chief purpose of these people investing in a herd is that they may get into the show game which has impressed them as the glamorous, appealing sport that it is.

They soon learn that there are other prerequisites to winning besides buying sale toppers for show cattle or showyard champions for breeding stock. Or perhaps they do not have the herdsman competent to fit their cattle to win. At all events they do not win and, since they can not take defeat, they quit. There are also those who do not suspect that the cattle business, like many other things of glamorous appeal, has an unglamorous side. When they learn of all the headaches, disappointments, frustrated plans and even losses by death or disability, that may attend, what can ultimately become a successful operation, they lose heart and become unwilling to see

it through. Hence, not all newcomers to the breeders' ranks contribute much to the welfare of the breed at large. Their initial buying splurge was good business while it lasted but their tenure was short.

It is not this way however with a great many of those who are making their first investment and taking their first step as breeders. They have harbored no false illusions as to what they were getting into but instead have become well informed before spending a dollar in the purchase of a hoof. They may encounter adversity of the usual sorts but not unexpectedly so they are prepared to meet and overcome it. They have worked out, as a result of a comprehensive study of the situation and what it involves, a definite conviction and they have the courage to carry on. They may bring to their breeding venture the benefits of a broad experience in business and the balanced judgment and sound sense which such an experience engenders. These people do not turn tail and run at the first signal of distress on their stock farms but they stick it out persistently and consistently, to a successful consummation of well laid and skillfully executed plans. Such breeders are a great asset to the breed organization with which they are affiliated and deserve the heartiest support and cooperation of fellow breeders.

Beginners must qualify if they are to become successful breeders. Breeding livestock is more complex than is realized generally and involves knowledge and skills, the importance of which is too often underrated. There are fundamental and essential qualifications, the possession of which is of primary importance to the owner, if he is to operate his own breeding establishment, or to his representative, if he employs a manager. Business ability is an important aid but one can be a first class cattleman while a third class business man. Amos Cruickshank depended upon his brother Anthony to manage the business at Sittyton while he managed the herd. Business ability alone will not get the cows bred to the right bull or pass sound judgment on the calf crop in picking out prospective herd sires and foundation females. Nor will it, by itself, negotiate the purchase of the particular sire that is best adapted for use on the females in the herd or the best sale of animals in offer from the herd. It takes an extra special brand of business acumen coupled with proficiency in judging animal form and knowledge of pedigrees, to appraise accurately the potential value of a calf or the actual value of a mature beast of either sex. Full appreciation of these facts, by the novice breeder, should come first in the list of his necessary qualifications.

Next should be the proper conception of breeding as a constructive operation. The breeder builds, generation by generation, and while the structure he creates is intangible, in that it cannot be measured or weighed, it is very real as becomes evident from a study and evalution of a successful breeder's achievement. The far reaching benefits derived from a great herd of cattle, either directly or indirectly, are well nigh incalculable in terms of human welfare and will astound, by their magnitude, anyone who attempts to figure them out. The structures with which we are most familiar usually are built accordingly to blue print and specifications. And so it should be with the breeder's constructive effort. It should be planned carefully and blue printed well in advance of the beginning of the actual breeding operation. The breeder must develop a program setting forth definite objectives toward the attainment of which he plans to work. If asked what he expects as the result of ten years of constructive breeding effort, the intelligent breeder should be able to forecast, with a reasonable degree of accuracy the sort of cattle he will be producing ten years hence.

With his breeding structure blue printed and specified and his program of breeding operations laid out, the next procedure for the beginner should be the acquisition of herd sire and breeding females. This, especially the selection of the sire, is, by far, the most important step in the whole business of founding a herd. Furthermore, it must be guided by a definite purpose and follow a specific pattern or failure is almost inevitable. Too many uninformed beginners reverse the order and lay in foundation stock first, then build a program around it. This is a most impractical and illogical procedure usually destined to fail.

One of the most confusing items to the inexperienced breeder is the proper evaluation of high condition in breeding animals. He is confused because he is told that fat will ruin animals for breeding purposes yet his own observation tells him that they can neither win nor sell well if they are not fat. The actual facts are that it is not so much a matter of how fat cattle may be made for show or sale but how they got that way. The manner in which the high condition has been produced and is subsequently reduced, when the show season or the sale is over, is the important consideration. It is true that many potentially valuable breeding cattle have been ruined permanently by incompetent fitters yet it is equally true that many of the greatest breeding bulls and females have scored their initial success in the showring, after being highly fitted. The difference is that in the first in-

stance they were merely fattened, in the latter they were skillfully fitted. While, perhaps, the same amount of feed was used in both cases, the end results were quite different.

Not only is skillful fitting essential to put them in high condition without damage to fertility but the subsequent "letting them down" requires equally competent handling if their breeding efficiency is to be unimpaired by their preparation for show. Fat may be employed to cover up unattractive faults in the cattle. Horseman say "fat is the best color" implying the same thing. Consequently, the person who is spending good money, and lots of it, should be able to visualize the cattle under inspection as though devoid of the embellishment that results from putting them in high condition, even by competent fitters. It may be better to see breeding cattle in their work-a-day clothes but then some speculation is necessary to think of them as they would be if fitted. If one is smart enough to discount the camouflaging effects of being fat, when and where it is necessary to do so, he has the advantage of seeing the cattle, which he may propose to buy, at their very best with all potential possibilities fully realized through the process of fitting. Certainly that is an advantage.

A concluding qualification for the beginner to acquire, of comparable importance to any listed, is the proper point of view or attitude of mind. His indoctrination is not fully accomplished until his mental attitude towards the career he is about to adopt is carefully checked and corrected. A big, broad open mind is definitely correlated with the successful operation of a stock farm. Any other type of mind, in this business, is as ill adapted as the square peg in the round hole.

It is a little that way in the cattle business. The person who can expect the fairest counsel and guidance from the old timer, whether he be the seller or not, is the new comer who maintains an open mind and willingness to listen when his experienced senior talks. Any other attitude may mark him, especially if he is known to have money to spend for cattle, as something of a sucker to be played by the unscrupulous dealer, of which few sale rings are entirely free.

The greatest service that an established and experienced breeder can render to the beginner is to guide him in the selection of his foundation stock seeing to it that he chooses wisely as to individual selections and does not overbuy, as so many beginners do, also that he procures his selections worth the money.

The importance of the man factor in attaining success in a breeding project may be discussed

appropriately either first or last, in sequence. First, because no breeding enterprise can succeed without him. He may be owner and operator as in the smaller herds or he may be manager, as of the larger establishments but whatever his capacity, he must be. Last, because no matter how many attributes are listed as essential to the success of the breeding operation they may all be rendered null and void by the absence of a competent man at the helm. Some of the most eminently successful breeding herds in this country have been represented by a partnership between a business man, possessed of an interest in the cattle and the means, and a cattleman in whose hands the active management of the herd was vested.

All activities, the practice of which constitutes herd management, come under one or more of these major headings, production, reproduction and disease control. The maintenance of a high level of reproductive or breeding efficiency in his herd is of paramount importance to every breeder, be he newcomer or oldtimer but special stress is put on disease control, when addressing newcomers, because many new herds, auspiciously begun, have been wrecked by disease, the serious threat of which had been overlooked in the desire to assemble good cattle.

Disinfecting Soils

Condensed from Eastern States Cooperator

Dr. E. F. Guba
University of Massachusetts

Soil disinfestation implies the treatment of soil to cleanse it of undesirable plant or animal life such as harmful insects, fungi, weeds and nematodes. It is not the intent to remove all microorganisms and certainly not the beneficial kinds, so our aim is more appropriately partial soil sterilization or pasteurization. The practice is highly desirable in the vegetable and flower growing industry and in plant beds under glass. Without this preventive measure, plant and crop failures from disease would be serious.

Among the numerous soil-in-

Reprinted by permission from Eastern States Cooperator, August 1948, Springfield, Mass.

festing organisms causing plant diseases, Club Root, Root-Knot Nematode, Bacteria, Pythium damping-off, Rhizoctonia, Sclerotinia, Botrytis, Verticillium and Fusarium are notoriously destructive. Seeds, seedlings and plants in all stages of growth are attacked. Ordinarily both the parasites and their hosts have similar requirements for optimum growth. Control, then, is derived by the eradication of these undesirable soil creatures by appropriate soil disinfection treatments.

On the basis of many years of experimentation and in collaboration with other institutions, the best chemical treatment for each type of vegetable seed for "damping-off" control in our area has been determined. These dry chemical seed treatments obtain partial disinfestation of the soil adjacent to the seed. Vegetable seed treatment charts are available at all of the county extension service offices. More complete disinfestation of the soil is obtained with chemicals, or by heat at temperatures of 175°–200° F but no higher. The use of heat in outdoor seedbeds, hotbeds or cold frames is rare in view of the inaccessibility of these areas to a source of steam. In such situations, chemicals are more practical and advantageous.

Heating the Soil: The application of heat is the oldest and the most complete method of disinfesting soil. Growers and scientific workers have devised many ingenious methods of disinfesting soil with steam. The delivery of steam into a system of perforated pipes, down-spouting or tile buried in the soil in ground beds or benches is very satisfactory. Small quantities of soil for flats and pots may be disinfected as needed in electric pasteurizers or in bins or frames piped for injecting steam. Many growers, especially florists, stack pots or flats of soil in a metal-lined truck body. The load is brought to the boiler house and heated with steam from the steam boiler.

Heating the soil excessively reduces its water-holding capacity. It also creates an excess of water-soluble salts, especially in a potentially rich soil. In the absence of nitrifying bacteria removed by excessive heating, the plants may even manifest hunger signs for nitrogen. Fortunately, frequent watering will sooner or later restore the soil to a healthy state.

The treatment of the soil with hot water has many commendable features. Excess soluble salts are removed and the temperatures are not as harmful and destructive as high temperatures from dry steam. The method is laborious, as a large volume of water and more time are neces-

sary before the soil can be planted. Hot water is widely used to disinfest ground beds in greenhouses planted to cucumbers and tomatoes and it is regarded as the best method of disinfesting soil for sweet peas.

Chemicals: Formaldehyde is effective in combating damping-off and most other soil microorganisms causing crop plant diseases excepting the root-knot nematode. There are three acceptable methods of use. By the drench method the turned-over soil is wetted with formaldehyde solution, one gallon in 50 gallons of water, at the rate of one gallon per square foot. This is an acceptable soil treatment for empty greenhouses and outdoor plant beds but application in outdoor beds is permissible only in the warm months, or from May to November, and never in the winter season. Ten to 14 days must elapse before the soil can be planted. Drenching assures a fairly complete disinfestation of the soil but because formaldehyde does not control the root-knot nematode its use on a large scale under glass is only occasional. Pumping the solution from a large outside tank into the greenhouse and distributing it by an overhead piping system is most practical and labor-saving.

For disinfesting small quantities of soil used for filling flats and pots, 2.5 tablespoonfuls of formaldehyde and 15 of water are poured together, sprinkled over a bushel of soil and mixed thoroughly. The treated soil is placed in containers and allowed to stand for a day, then seeded and watered. Two days should elapse before planting seedlings.

By the third method, formaldehyde solution is applied to the seedbed after the seeds are sown. Formaldehyde (two tablespoonfuls) and water (three gallons) are applied to the finished seedbed at the rate of one gallon to five square feet. This method is very practical and is applicable to flats, frames and hotbeds and to all types of vegetable seedbeds except Crucifers (cabbage, etc.) This simple surface treatment of the seedbed after sowing the seeds takes the place of the first watering and provides an ingenious method of controlling damping-off.

During the last 15 years great progress has been made in the use of soil fumigants having remarkable insecticidal and nemacidal properties. Beginning with chloropicrin, others have followed, notably dichloropropene mixtures (DD), ethylene dibromide and methyl bromide. These fumigants do not accomplish as much as steam or heat, but they offer an

easier, cheaper and quicker way to control nematodes, wire-worms and insects. Chloropicrin especially possesses the property of killing damping-off and other soil-borne fungi such as Fusarium and Verticillium, as well as most weed seeds. It does not control satisfactorily Sclerotinia, Rhizoctonia and Botrytis unless high dosages are used in moist soil and under prolonged confinement of the gas. Methyl bromide at greatly increased dosages is also effective. In the northeastern states chloropicrin has found wide and acceptable use in tobacco seedbeds and green houses. In outdoor beds that are to be planted in February or March, application is made in the previous summer or autumn months when warm temperatures prevail.

These soil fumigants are injected into the soil in spaces 10 inches apart and four inches deep. Conditions that qualify . . . vary more or less with each chemical and must be followed to obtain satisfactory results and to reduce hazards. Progress is being made in perfecting devices for applying the chemicals. Until cheap practical devices are available to the grower, the application of these chemicals will require the service and the attention of the dealer.

Rhubarb And Teeth

Condensed from the Dakota Farmer

THE new discovery that rhubarb protects teeth against erosion by acids may put this springtime pie and sauce favorite into year-round use, the New York State Experiment Station reports. The discovery was made by Dr. C. M. McCay of the Animial Nutrition Laboratory, Ithaca, N. Y., who reports that rhubarb juice mixed with lemon juice will prevent the acid in lemon juice from dissolving the surface of teeth. Dentists have reported that some patients have part of their teeth dissolved away by daily drinking of large quantities of lemon juice for arthritis and constipation. Some popular soft drinks containing acids also may cause this damage to teeth.

While on duty with the Navy during the recent war, Dr. McCay observed that the most popular

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May 1, 1948, Aberdeen, S. D.

soft drinks bought by the men outside the mess hall were the cola beverages which contain substantial quantities of phosphoric acid. He thought that "bathing" the teeth so frequently in a liquid containing this acid might cause erosion. With the help of a Navy dentist, he began research on the question. He found that a couple of human teeth, immersed in a cola drink, softened in two days. The same beverage fed to monkeys, dogs, rats, and mice in the laboratory dissolved the surface of the molar teeth of all these animals in from two to eight weeks. Studying other common acid beverages, he found that both lemon juice and synthetic lemonade etched teeth as badly as the cola beverages.

Research was then started by the Navy to discover some natural foodstuffs that might protect teeth against acid damage. Small quantities of fluorides were tried but they gave only partial protection. After nearly two years the group of dentists and nutritionists, after feeding tests with hundreds of experimental animals found that a small amount of oxalate in an acid beverage would protect teeth completely.

Nutritionists have long known that many foods, especially rhubarb and spinach, contain considerable quantities of oxalate or oxalic acid which will unite with calcium to form an insoluble compound. Apparently this is the effect of the oxalate in rhubarb on the calcium in teeth.

Trials are now in progress to learn how much rhubarb juice should be drunk, or how much sauce eaten, to provide the best protection for teeth. Of importance also is the question of using rhubarb or other foods rich in oxalate so that they will not "tie up" or make insoluble the calcium in milk or other foods which must be in a soluble form to be used by the body.

Dr. McCay believes that the discovery may expand the market for rhubarb and lead to a new industry in bottling rhubarb juice and canning rhubarb sauce.

Estrogen Fattens Turkeys Faster

Condensed from Turkey World

George T. Davis
Oklahoma A & M College

WILL estrogen fattening have a future in the turkey industry? We who have worked with estrogens at the Oklahoma Experiment Station believe they will—provided they are properly used.

Before going into a discussion of the work which makes us optimistic about estrogen fattening, we should consider what estrogens are and what they do.

Estrogens are hormones which in nature are produced by the ovaries of all females. In the turkey hen they are not produced in quantities until just before the hen starts to lay. At that time the estrogen is responsible for the deposition of large amounts of fat in the muscles, under the skin and in the visceral and abdominal sections.

In recent years chemists have learned to manufacture compounds which have the same effect on the body as naturally produced hormones. By the use of these laboratory-made estrogens, we hope to fatten birds before they reach sexual maturity and to produce this fattening effect on both males and females. We simply duplicate nature's most effective method of producing fat at ages and seasons that suit our own conveniences rather than nature's.

Other effects of the estrogen contribute to the value of the birds at market time. They apparently stimulate feed consumption. In older turkeys this results in increased weight gains which are economically produced. The number of pin feathers on the dressed carcasses is greatly reduced.

The sexual behavior of the birds is somewhat altered. As administration of the estrogens continues, the mating instinct of the females becomes more pronounced. With the males the treatment does not last long enough to repress their mating instincts. Thus, treading in mixed flocks increases.

The process has been described as chemical caponization for males. This leads to an erroneous impression because the fattening is due to the presence of female hormones rather than absence of hormones.

Experimental workers have used

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several estrogenic compounds which they have administered by two different methods. One of these methods, the implanting of diethylstilbestrol pellets under the skin of the neck, is being employed in producing chicken meat. Work reported from the California and Michigan experiment stations indicates that the pellet implantation method of administration is not very successful with turkeys.

At the Oklahoma Experiment Station we have used the method of feeding estrogen in an all-mash fattener. This feeding method was adopted because of several advantages it has over other methods. The birds require no handling and can be fattened on range or in confinement pens. The fattening period is shorter, and the results are more pronounced and uniform. The compounds used in this work are dianisylhexene and triphenylchloroethylene, both of which are chemical "relatives" of diethylstilbestrol, but are better adapted for feeding. Another compound which shows promise of being satisfactory, but which has not been used in fattening trials for turkeys, is triphenylbromoethylene. The estrogen feeding method has not been approved by the Food and Drug Administration for use in interstate commerce and can be used at present for experimental purposes only.

Our work has been confined to Broad Breasted Bronze turkey fryers and roasters. Fryers were used to determine the feasibility of opening up a new field of turkey production. If the fryer production should become a practice in the turkey industry, breeding flocks and brooding facilities could be utilized over a longer period of time. Roasters were fattened at an age and size which would permit them to compete with small type turkeys, and which would permit late hatched poults to be finished for the Thanksgiving market. The work has been carried on with sufficient numbers, and with enough repeat trials, to give us confidence that the results we obtained were typical for the treatments and not due to chance differences.

The amount of estrogens in the feed is small, even smaller than is required for chickens. One pound of dianisylhexene is enough to make 15,100 pounds of fattening mash for roasters—enough to fatten more than 1,500 turkeys.

Turkey fryers were put on the estrogen feeds at 9, 10, and 11 weeks of age. Some received 50 mg. (milligrams) of dianisylhexene per pound of feed, while others received 100 and 200 mg. of thiphenylchloroethylene per pound of feed. One group received no estrogen at all. Part of the birds from each group were dressed after two weeks of feeding and the others were held for three weeks. The turkeys receiving 50

mg. of dianisylhexene and 200 mg. of triphenylchloroethylene for a period of three weeks were best. The older birds, however, were of better market quality.

To determine differences in fatness, the birds were classified into two grades, with grade 1 equal to well finished turkey roasters. In the 50 mg. dianisylhexene group which were fattened for three weeks, 76 percent classified as number 1's, while only 16 percent of the non-estrogen birds were in this grade. Reduction in pin feathers was equally pronounced. There were no important differences in either growth rate or feed economy between the groups of fryers.

What are the possibilities for turkey fryer production? If turkeys can be finished as well at 12 to 14 weeks of age as they ordinarily are at twice that age, and turkey toms weighing up to 11 pounds can be cut up, and fried as tender as any chicken, the market possibilities seem tremendous to us.

The feeding trials with turkey roasters were even more successful. All turkeys were 20 weeks old at the start of the tests. Dianisylhexene is the only estrogen that has been used in our trials to date. It was tried at levels of 30, 40, 50, 60 and 80 mg. per pound of feed for fattening periods of two, three, and four weeks. The best results were produced in the groups receiving 30 and 40 mg. for a period of two weeks. When graded into U. S. Grades, the estrogen fattened turkeys average slightly below grade A, while the non-estrogen turkeys averaged below grade B. Pinniness was improved one-half grade by the use of estrogen feed. Grading was done by the PMA officials of the U. S. Dept. of Agriculture who train U. S. graders in this area.

The estrogen-fed turkeys gained much faster during the trial and averaged ½ to ¾ pound heavier than the non-estrogen birds at the end of the two week fattening period. And they used 20 to 25 percent less feed to produce a pound of this gain. The total average gain for the estrogen-fed turkeys ranged from 2 to 2½ pounds per bird.

At the end of the fattening period, the hens averaged 10 to 12 pounds in weight and the toms 13 to 15 pounds. These birds were only 22 weeks old, and small enough to demand top prices. But they were well finished and economically produced.

Our work indicates that several precautions should be pointed out. Estrogen levels higher than those found to be best are dangerous. So are fattening periods of longer duration. With the roasters, treading in the high estrogen pens resulted in torn skin on the females. This was not the case in the pens which received low levels

of estrogen for feeding periods of two weeks. Weight gains and feed economy were reduced when the estrogen feeding was continued beyond two weeks; therefore, estrogen feeding beyond two weeks was uneconomical.

The fattening rations used in these studies were similar to those normally fed to growing turkeys. The ration for fryers contained approximately 23 percent protein while that for the roasters contained about 16 percent. All-mash was used in both instances, so all birds within each group would be uniformly fed.

The estrogens were dissolved in crude soybean oil and two percent of the estrogen-carrying oil added to the mashes. If the feeding method of fattening is adopted by the turkey industry, estrogens may be put on the market in such oil solutions. The oil may be easily weighed or measured for mixing in the feed.

One reason for the delay in the use of estrogen for fattening turkeys is the fact that the Food and Drug Administration has not approved the method. Since they now permit estrogen fattening by other methods, approval of the feeding method should come before long.

Feeding Methods for Pullets

Condensed from the Rural New Yorker

G. T. Klein
University of Massachusetts

THERE is more to having good weight on pullets than shows on the scale or meets the eye. Bodyweight can serve as a good production guide, a mortality yardstick, and as an egg size measure. In bodyweight, there is a wealth of information.

It is dangerous to guess at the meaning of scientific data. That is why poultrymen the world over, turn to geneticists, like Dr. F. A. Hays, University of Massachusetts, for technical breeding information. This Massachusetts geneticist, after studying bodyweight and the many breeding characters which relate to egg numbers, size, mortality and profits comes up with the follow-

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ing convincing facts and conclusions:

1. Pullets gain fastest in bodyweight the first month after housing. Most pullets in the Rhode Island Red flock studied gained one-fourth pound a month after the first month up to 11 or 12 months of age. Total gains of one to one and one-half pounds were made between September housing time and March 1.

2. Good Winter egg size was always accompanied by good bodyweight. The heaviest pullets gave the largest egg size.

3. Death loss was lowest in those pullets that gained about one and one-half pounds between housing time and March 1. Pullets that have not gained from one to one and one-half pounds by March 1 could be sold with a financial saving.

4. The best layers are those gaining about one pound during the laying year. Pullets with the heaviest bodyweight at housing time gave the longest period of egg production.

5. A loss of about one-third pound in bodyweight during the Summer months is to be expected. Appetites for mash drop and it is hard to avoid this loss. The decrease in bodyweight is, of course, much greater than one-third pound during the annual molt.

We have in such an investigation a tremendous amount of practical information to guide poultry keepers in the feeding of their flocks. A review of available literature shows that it also works practically the same with White Leghorns, Barred Rocks and other breeds as with the birds studied. Before leaving the tests, it should be pointed out that these birds were hatched during the Spring months and were not out of season December or January birds, which no doubt would have behaved differently.

It is a good thing to have heavyweight on pullets when they are housed. They start laying larger eggs and they also stand up in production over a longer period. If pullets are lacking a little in weight, however, there is no need to throw up your hands in despair, because these birds will gain steadily the first month after they are housed. We have had the experience of housing pullets that were a pound lighter than normal due to heavy restricting of grain and mash on range. Feed consumption in the house was consequently heavier than normal and gains were far greater than can usually be expected.

It is inconsistent to try to hold birds back with inadequate feeding for greater age at laying time, and at the same time have heavy weight on them. Holding back can only be done by restricting

their feed. The best feeding method for finishing pullets during those last days on the range is either a full feed of grain and mash or grain and pellets. The point is that you get the best weight on pullets by feeding about all they want, provided that the flock was brought off at a normal Spring hatching date.

The time of housing probably has more influence on the weight of a flock than we have previously supposed. It has been a common practice to house when 10 per cent of the flock is laying. If this is followed, then most of the flock is in the house to put on those rapid gains before they start the year's production job. If you know your strain, you know about when to house. With Dr. Hays's Reds it was at 170 days, and no more than 10 per cent of them were laying at that time.

No matter what feeding method you have used on the range, you can always go to grain and mash in the laying house. It is the favorite method of most poultrymen. It has advantages that cannot be claimed by other systems, because you have better control over what the birds eat and more chances to change their diet, with chance to use supplemental feeding as needed. It is the best plan to use with floor litter because it induces more scratching and gives the least wet droppings around the hoppers to cause wetness and packing of the litter. In Massachusetts R. O. P. work the heavy grain feeders make the best records and have the best bodyweight.

All pellet feeding in laying houses has not worked out entirely satisfactorily. One reason is that in cold weather, or any time when a feed supplement is needed, there is nothing to turn to. Complete or all-mash feeding is not objectionable from the standpoint of low production or low hatchability. It is on a par with other feeds in these respects. It is the worst offender on wet litter and it is no method for a farm where some home grown grain is raised that can be worked into a ration to lower its cost.

To keep birds eating and gaining weight while they are giving 60 to 85 per cent production is where skill comes in. Recently I had occasion to check the methods used at the Storrs and New York egg laying contests. Here it is the business of the managers to get every possible egg out of the birds. Methods which the managers have found to do the job well over a period of several years, ought to have something in it of value for poultrymen, provided that the contest methods do not involve so much work that they are impractical.

When the Storrs contest birds

arrive for this egg laying marathon, they are put under all-night lights. These are used continuously throughout the year. They get a dry mash, mixed according to the New England College conference formula, plus 40 grams of nicotinic acid per ton. The grain formula is 1,100 pounds of corn, 500 pounds of wheat, 400 pounds of oats. In the Summer months 300 pounds of barley replaces 300 pounds of corn.

The mash is kept before the birds all the time. Hoppers are refilled when they need it. There are plenty of hoppers for all birds to eat at one time if they want to. The amount of scratch grain is regulated by appetites. They have about what they want. Two-thirds of the grain is thrown in the litter at the last egg gathering in the evening and one-third in the morning at the first trapping or egg gathering. As extras, pellets are fed at 10 a.m. at the ratio of three pounds to 100 birds. A wet mash containing two pounds of semi-solid buttermilk and three pounds of dry mash is fed to 100 birds at 1 p.m. daily. This wet mash is stepped up with one-half pint of vitamin A and D feeding oil and one quart of molasses. The feeding plan at the New York contest is similar.

While some poultrymen may argue that it does not pay to feed these extras, yet they are used in places where top performance is the goal. There seems little doubt that the pellet feeding is a good thing. The wet mash mixture may be more of a question. It is not a question whether a flock eats more when they have wet mash; that is certain. The debatable point is whether they lay enough more to pay for the extra trouble.

With this plan of giving a flock all the grain they want to eat, the grain consumption is likely to run ahead of the mash. That must not be too serious for out of these contests come some of the highest records in the world. With this plan of adding milk, molasses and vitamins A and D to the wet mash, there should be no fear about lowering hatchability. The essentials for hatchability lacking through this so-called unbalanced ratio of grain and mash are supplied through the wet mash. Whether it pays year in and year out to feed a wet mash may be a question. It is almost certain that it pays to feed it when a flock has some disease, such as bronchitis, Newcastle and the like. Heavy feed consumption always brings flocks back to health and laying more quickly.

Silage feeding of layers is suitable from the standpoint of palatability, and perhaps hatchability. Silage, though, takes too much labor on a specialized poultry

farm. On a general farm where it is preserved for dairy cattle and beef stock, it can often be used to advantage for poultry. Green crops cut for the layers is also a high labor cost feeding practice and is therefore of questionable value.

There are probably other feeding factors that we still know little or nothing about. Deep, built-up, long used litter which once seemed so objectionable to poultrymen, because of possible disease causing organisms, has been recently found to contain vitamins beneficial to health, growth and hatchability. Birds eat considerable quantities of this litter and show improved performance. It also reduces cannibalistic tendencies.

Poultry nests are becoming an increasingly important consideration for the flock owner. With the newer types of community nests, the percentage of clean eggs is greatly increased; egg breakage is reduced, and so is the egg eating and cannibalism. Litter stays in the nests for weeks requiring attention no oftener than once in six weeks. The individual type of front entrance nests needs litter replaced at least each week.

There is no sure-fire way of getting pullets to lay in nests rather than on the floor. Usually, if they are housed before production starts and if there is not too much litter in the nests when first housed, little trouble is experienced. If a flock lays on range, the nest used there should be the same type which is to be used later in the laying house.

Chemical Warfare Against Weeds

Condensed from The Kentucky Farmer

Patty Shannon

ONE of the farmer's biggest and most constant problems is the annual battle which he must wage against weed pests which threaten his crops. Weeds cost the Kentucky farmer hundreds of thousands of dollars every year. But steady progress in the field of chemical weed eradication, according to reports of plant scientists throughout the country, promises ultimate control of many of the farmer's worst field pests. New chemicals now available and the development of new methods of weed eradication by means of spraying, point to a day when weeds will become of only minor importance and fields will be clean and fertile.

A number of kinds of chemicals have been used in weed killing processes. For example, farmers have known for some time that the chlorates (sodium and calcium) will kill weeds—but these chemicals have the disadvantage of killing everything else, in addition to making the ground unusable for several seasons. Arsenical poisons may also be used in weed eradication—but they, too, kill everything and often kill livestock as well.

2,4-D Wonder Chemical

One of the most-discussed and most-used weed chemicals of today is the wonder-chemical, 2,4-D. It is the shortened name for 2,4-Dichlorophenoxyacetic acid, a wartime organic chemical which has become our most important chemical herbicide. It has done much toward changing the farmer's method of dealing with weeds, and weed eradication authorities consider that under some conditions the obvious economy from labor saving and increased yield will make the new method a "must."

2,4-D is highly selective in action, and does not kill all plants. It is most effective on broad-leaf ones, a characteristic which enables farmers to kill weeds in lawns or pastures. as well as in certain field crops, without injuring grass or crops.

Kinds of 2,4-D

There are three types of 2,4-D weed killing preparations—esters,

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amine salts and metallic salts. For killing weeds in crop fields, neither esters nor salts are considered hazardous when used at the proper dosage level and at the recommended stage of crop development. Since the esters are more active per unit of 2,4-D acid, they are recommended on growing crops at considerably lower dosages—only ¼ to ½ as much as for salts.

An ester is a salt made by combining an acid and an alcohol. Several esters of 2,4-D are now in commercial use, including the ethyl, amyl, iso-propyl, and butyl. There seems to be little to choose between these. Esters of 2,4-D are oily liquids containing from 10 percent to 45 percent of the parent acid. All form milky emulsions with water. Esters, while more expensive, usually are more active than the other salts especially under unfavorable weather conditions and upon the less susceptible species. When used as a selective spray in crops, an ester should be applied at a lower rate than the other types.

Dilute sprays made from preparations with lower 2,4-D acid content are especially well suited for small areas, such as lawns. They penetrate the dense grass and get to young weeds. Also, with dilute sprays there is less danger of injuring shrubs and flowers by too-close spraying, or by the wind blowing spray on the plants.

Which Crops to Spray

Crops in which 2,4-D sprays have been successfully used with safety and effective weed kill include corn, sorghums, small grains (oats, wheat, barley), some varieties of flax, sugar cane, rice and grass (for seed crop). There are reports of 2,4-D being used successfully in strawberry beds (in summer after harvest), also on fall-seeded spinach (as a pre-emergence spray). Further work must be done on these and other broad-leaf crop plants, however, before the use of 2,4-D can be advised.

2,4-D in Corn

The corn crop offers the greatest field for saving labor and gaining in production, despite the fact that we are still in the beginning stage with this practice with 2,4-D. Although corn can be hurt by this chemical, weed specialists have established the fact that a light dosage can control weeds in the cornfield without damage to the crop. The specialists generally recommend that the corn crop be cultivated once or twice, however, even when 2,4-D is used. Most soils can use the cultivation. However, 2,4-D has given its most spectacular results in instances

where it was impossible to cultivate because of a wet season.

Henderson County, Kentucky, was made a proving ground last season for the effectiveness of 2,4-D in killing weeds without injuring corn when the county found itself threatened with a corn crop failure at the end of a three months rainy season. When the rains let up on the last day of June, cornfields with corn from 10 to 18 inches high had weeds from 6 to 10 inches higher than the corn in most cases. Through the ingenuity of farmers throughout the county and aided by engineers of commercial weed spraying companies, more than 14,000 acres of corn were treated successfully with 2,4-D spray.

Method of Application

2,4-D sprays for weeds in corn and sorghum are applied when the corn plants are 8 to 15 inches high—or at any stage, so long as the plant is more than 6 inches high. Corn is fairly tolerant at that stage, but is more sensitive to 2,4-D a little later when brace roots start to form. Later, it is more tolerant again. The sprays are applied with row crop sprayer, or with combination cultivating-spraying rig, say at the second or third cultivation.

The amount of 2,4-D preparation to use depends on how much 2,4-D acid there is in it, and also on the type or form of 2,4-D. With a 40 percent 2,4-D product of the amine type, use ½ to 1 pint (usually 2/3 pint) per acre. If the weeds are susceptible, the smaller amount will get them; if not susceptible, the larger amount may be advisable. Too heavy an application of 2,4-D, especially if corn is at the susceptible stage, may reduce corn yield. In general, low volume application (5 to 10 gallons of spray per acre) is best. This way the weeds are not drenched, but "fogged."

In determining the dosage concentration, the farmer must bear in mind that a thin, young stand of weeds in the field requires a smaller dosage than a thicker and more mature stand of weeds. Under any circumstances, there is very little, if any, danger in applying 4/5 pint of 40 percent ester per acre. Farmers are advised, regardless of the 2,4-D product used, to follow carefully all directions given on the package.

Where corn is grown for seed, farmers are cautioned against using any 2,4-D product on inbred lines, foundation corns, or single crosses and double crosses.

Although the general recommendation for the amount of water to use is 5 gallons per acre, with the new low-gallonage method, almost any quantity of water may be applied, depending on available spray equipment.

In spraying with 2,4-D, do not allow spray or spray drift to settle on susceptible crops such as tobacco, cotton, tomatoes, peas, beans, sugar beets, alfalfa. It is suggested that the sprayer be kept at least 200 feet away from such susceptible crops if the wind is blowing from the sprayer toward them.

Pre-Emergence Spraying

In some areas, effective weed control has been secured by spraying cornfields with 2,4-D at five to eight days after planting. In other areas, under different conditions, results have not been so good. Hence, the crop specialists are not in agreement on pre-emergence sprays and farmers will have to wait until more research work has been done with them under varying conditions.

In discussing the development of 2,4-D, L. W. Kephart, weed specialist of the U. S. Department of Agriculture, points out that the advance against weeds is not yet on an even front. Not all weeds give way readily to 2,4-D and some crops, unfortunately, are vulnerable to it.

It must be remembered, too, that practices must be modified because of soil type, moisture, or lack of it. Not only that, but conditions make a difference in the selection of chemicals. Dinitro compounds are as effective as 2,4-D on most annual and winter annual weeds when they are young and tender and when moderate temperatures and dry weather prevail. But 2,4-D has been found more effective on larger weeds and when the weather is cool or wet or both.

Biennial and perennial weeds do not respond uniformly to 2,4-D treatment, only a few perennials — notably dandelion and plantain—being usually killed by one application. 2,4-D destroys the seed-producing power of most perennials, however, and may delay regrowth for one to three months. Such treatments must be repeated at least annually but often are profitable merely for preventing seed formation.

In lawns, meadows and pastures, 2,4-D is superior to all other herbicides to keep down all kinds of weeds—both annuals and perennials.

In fighting woody weeds, specialists say that the best practice is to mow them or otherwise cut them and then treat the regrowth with 2,4-D.

In Small Grains

2,4-D may be used successfully in controlling weeds in spring and winter wheat, oats, rye, barley and flax.

The legumes which are usually seeded with small grain (clover, alfalfa, sweet clover) are broadleaf plants—hence susceptible to injury from 2,4-D. If a serious

weed problem is at hand, however, and if the farmer is willing to lose up to 60 percent of his legume, chemical research authorities state that he may spray with as much as a pint of the chemical per acre.

Most perennial grasses when well established are not hurt by the amount of 2,4-D normally effective against the usual run of weeds. Creeping bent grass is susceptible to 2,4-D injury. Young seedling grasses are sensitive.

Spraying Equipment

Sprayers suitable for applying 2,4-D in corn are on the market. Some farmers are using homemade outfits, which usually consist of a one-inch pipe with low-volume nozzles set into it. The boom is attached on the tractor frame, preferably out in front where the operator can watch it. The spray pump unit can be mounted on shelf or bracket ahead of the tractor pulley and the pump belted to the pulley with a V-belt. You don't need a high pressure outfit—in fact, authorities state that there is less spray drift from a low pressure rig.

Farmers who already have row-crop sprayers may decide to use them for applying 2,4-D in crop fields. If this is done, here is a very important reminder: Failure to remove every trace of 2,4-D from the sprayer may result in serious injury to crop plants when the sprayer is used to apply insecticide or fungicide sprays. If at all possible, use a separate rig for 2,4-D. If not practical to do this, clean the tank, pump, hose, boom and nozzles immediately after using 2,4-D. Soak and rinse repeatedly with hot water (adding one gallon of household ammonia to 100 gallons of water). To make sure of a good soaking, it is suggested that the ammonia-water be left in the sprayer over night. Follow with several thorough rinsings to remove all residue.

Professor Kenneth Post, of the Department of Horticulture at Cornell University, emphasizes that mixing and weighing equipment should be carefully cleaned after 2,4-D. He urges careful cleaning also of shoes, clothing, and all garden tools after working with 2,4-D formulations.

WEEDS SUSCEPTIBLE TO 2,4-D WEED KILLERS

(One or two normal applications should get them)

Artichoke	Dandelion	Kochia	Sage Brush
Beggar Ticks	Evening Primrose	Loco Weed	Saltbush
Black Medic	False Flax	Marsh Elder	Slender Rush
Blue Bur	Fanweed	Morning-Glory	Sow Thistle
Buckhorn	Flower-of-an-hour	Mustards	Sumac
Bull Thistle	Galinsoga	Nettle (stinging)	Sunflower
Burdock	Ground Ivy	Pennywort	Water Hemlock
Butter Print	Gumweed	Peppergrass	Wild Parsnip
Carpetweed	Hedge Nettle	Pigweed	Wild Sweet Potato
Catnip	Hemp	Plantains	Winter Cress
Chickweed	Hemp Nettle	Puncture Vine	Vervain
Chicory	Henbit	Radish (wild)	Vetch (wild)
Cinquefoil	Horsetail	Ragweed	Virginia Creeper
Cocklebur	Jewelweed	Rape	Yellow Rocket
Cucumber (wild)	Jimson Weed	Rosinweed	Yellow Sorrel

WEEDS LESS SUSCEPTIBLE TO 2,4-D WEED KILLERS

(May need stronger spray or repeated application)

Bindweed	Dog Fennel	Lamb's Quarter	Russian Thistle
Bouncing Bet	Fleabane	Lettuce (prickly)	Shepherd's Purse
Buckbrush	Goatsbeard	Mallow	Smartweeds
Buckwheat (wild)	Goldenrod	Poison Ivy	Speedwells
Buttercups	Goosefoot	Pokeweed	Teasel
Canada Thistle	Gourd (wild)	Poverty Weed	Wild Garlic
Dock	Honeysuckle	Purslane	Wild Onion
Dodder	Knotweed	Red Sorrel	Yarrow

THESE WEEDS ARE RESISTANT TO 2,4-D WEED KILLERS

Barnyard Grass	Chess (cheat)	Ground Cherry	Quackgrass
Bermuda Grass	Crabgrass	Johnson Grass	Sandburs
Black Nightshade	Ferns	Milkweeds	Spurge
Bracken	Foxtails	Mullein	Violets
Buffalo Bur	Goosegrass	Oxeye Daisy	Wood Sorrel

(List reprinted from Service Bureau Bulletin, Dr. Hess and Clark, Inc.)

WEEDS SUSCEPTIBLE TO CALCIUM CHLORATE TYPE WEED KILLERS

(For Non-Selective Control)

Canada Thistle	Nut Grass	Russian Knapweed	Puncture Vine
Poison Ivy	Leafy Spurge	Yellow Toad Flax	Blue Lettuce
Quack Grass	White Top	Poverty Weed	Brush
Wild Morning Glory (Bindweed)	Bermuda Grass	Horse Nettle	All Other Undesirable Vegetation
Willows	Perennial Sow Thistle	Johnson Grass	

(IMPORTANT: Being a non-selective type of weed killer, calcium chlorate weed killer will damage or destroy ALL KINDS OF VEGETATION. Land treated with this type of weed eradicator may remain partially sterile for varying periods following treatment.)

This article is based on data released by the Agricultural Research Administration of the U. S. Department of Agriculture; The Agricultural Chemicals Division of The Sherwin-Williams Company; Dr. Hess and Clark, Inc.; Agricultural Insecticide and Fungicide Association; Chipman Chemical Company, Inc., and E. I. Dupont de Nemours and Company, Inc.

Recommended for The Farmer's Library

Beef Cattle Production in the South—By D. W. Williams, Head, Animal Husbandry Dept., A & M College of Texas. Interstate Printers & Publishers. $2.50.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College. Long's College Book Co. $4.75.

Dairy Cattle Feeding and Management—3rd Ed. By H. O. Henderson, Prof., Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $5.00.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof., Dairy Husbandry, Univ. of Minn. J. B. Lippincott Co. $4.50.

The Horse of the Americas—By Robert Moorman Denhardt, Editor of Western Horseman; foreword by J. Frank Dobie. Univ. of Okla. Press. $5.00.

Management and Feeding of Sheep—By E. T. Baker. Orange Judd Publ. Co., Inc. $3.50.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Agri., Univ. of Ky. McGraw-Hill Book Co., Inc. $4.50.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean, School of Vet. Med., Kansas State College. Interstate Printers & Publishers. $3.50.

Judging Dairy Cattle—By Edwin S. Harrison, Prof., Animal Husbandry, Cornell Univ. John Wiley and Sons, Inc. $3.50.

Livestock Judging Handbook—By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Prof., Animal Husbandry, Univ. of Idaho. Interstate Printers. $3.25.

Livestock Production—By Walter H. Peters, Chief, Div. Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $4.00.

Hatchery Management—By Roland C. Hartman, Editor of Everybody's Poultry Magazine, and G. S. Vickers, Field Mgr. of Ohio Poultry Improvement Assn. Orange Judd Publ. Co., Inc. $4.00.

Profitable Poultry Keeping—By H. Clyde Knandel, Head, Poultry Husbandry Dept., Penn. State College. Orange Judd Publ. Co., Inc. $3.00.

Poultry: Science and Practice—By A. R. Winter, Asst. Prof., Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof., Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Successful Poultry Management—By Morley A. Jull, Prof. and Head, Poultry Dept., Univ. of Md. McGraw-Hill Book Co., Inc. $3.50.

Commercial Poultry Farming—By T. Burr Charles, Poultry Husbandry Dept., Univ. of N. H., and Homer O. Stuart, Poultry Husbandry Dept., R. I. State College. Interstate Printers & Publishers. $4.00.

Diseases and Parasites of Poultry—3rd Ed. By Edgar Hugh Barger, D.V.M., and L. E. Card, Ph.D., Prof. Poultry Husbandry, Univ. of Ill. Lea & Febiger. $3.75.

Domestic Geese and Ducks—By Paul P. Ives, Pres., Am. Waterfowl Assn. Orange Judd Publ. Co., Inc. $3.50.

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BOOKS OF INTEREST

MALABAR FARM — By Louis Bromfield, author, lecturer, farmer conservationist; illustrated by Kate Lord.

In this delightful and important new book you will learn more about life at "Pleasant Valley." This story of day-by-day labor and planning is told in Mr. Bromfield's convincing and colorful style so that the seeding of a field, the blossoming of a weedy hill, the development of a fine strain of cattle becomes exciting drama. About one third of the book is made up of extracts from the Malabar Journal, recording roughly a year's cycle of life at the Farm. Here is a heartening book that will give you an unequalled picture of accomplishment at Malabar—of country life as it can be and is lived. Let us send you a copy.

Publishers: Harper & Brothers 405 pages $3.75

COUNTRYMAN'S COMPANION — Collected and arranged by David B. Greenberg, author, farmer; decorations by Jack Wilson, artist.

Here is a treasury of farm literature from ancient to modern times, written to give you exciting reading and good counsel. The book is full of "farm life adventures, such as sheep raising in Montana, mowing hay in up-state New York, horse raising in the West, bee-keeping, stories on everything from earth-worms, beans, poultry and cattle, to axe-helves and threshing machines." The *Countryman's Companion* presents country life as an art, as a philosophy, and as a practical way of life. The hero of the pieces making up this collection is the dirt farmer. You will want a copy of this delightful volume. It will make an excellent gift for your neighbor.

Publishers: Harper & Brothers 412 pages $3.00

THE FARMER'S HANDBOOK—By John M. White, practical farmer, formerly county agent, agricultural adviser, and technical expert at the Oklahoma A. and M. College.

This is a book which gardeners, farmers and livestock raisers will find invaluable. It is an easy-to-read reference book, with illustrations, tables and charts, covering practically the entire range of information concerning things that grow in and on the soil—from garden crops, poultry and livestock to corn, wheat, cotton and large-scale commercial-farm products in the United States. A vast amount of useful information to both farmer and county agent is presented in *The Farmer's Handbook*.

Publishers: The University of Oklahoma Press 440 pages $4.95

SUCCESSFUL PART-TIME FARMING— By Haydn S. Pearson, well-known author and farming authority.

In this book, the author outlines a practical plan by which the city worker may enjoy country living and yet follow his trade or profession. Every aspect of part-time farming is taken up in detail. Mr. Pearson's advice is specific and practical, abounding in helpful pointers, warnings and tips.

Publishers: McGraw-Hill Book Co., Inc. 322 pages $3.00

Our Soil: American Heritage

The Soil is the Heritage of Our Nation. We, who call ourselves the owners of the Soil, are only its Custodians for a brief span of time.

The Soil is our most priceless Possession . . . and our greatest Responsibility. Freedom has never flourished in a hungry and improverished land.

God grant us the intelligence to respect our soil, and the Will to conserve it in all ways, so that when our period of Stewardship is done, we may pass on the Soil with its Fertility and Fruitfulness undiminished. Thus, our children's children and their children's children shall not know want, and their Nation will remain the Land of Plenty and the Home of Freedom.

—Charles E. Sweet